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Area Board Electricians

E.T.U.'s REPRESENTATION CLAIM

THE Bethnal Green dispute between members of the Electrical Trades Union and the London Electricity Board, upon which a Court of Inquiry has now reported, could have been settled in a simple fashion by the transfer of the "upgraded" man who was the cause of the dispute from the Transport and General Workers' Union to the E.T.U. Apparently there was no serious attempt made by the two unions to arrange this, but even if it had been done the grievance of which this was a symptom would have remained.

It is the contention of the E.T.U. that it alone is competent to negotiate wages and conditions for men in the electrical contracting industry and in fact this is recognized by the "private" electrical contractors who form the other side of the National Joint Industrial Council for the industry.

Supply Industry Position

In the nationalized electricity supply industry, however, all electricians appear to be regarded in the same light whether they are employed in power station, distribution or contracting work. There are accordingly National and District Joint Councils (on which E.T.U. representatives are in a minority) covering them all, as well as other classes of manual workers. This is accepted by a number of other unions whose membership includes electricians.

It was stated at the inquiry that the Area Boards' electricians were liable to be put on to either "supply" or contracting work which the Court considers "a most desirable and sensible arrangement." It is an arrangement that was acquiesced in by the E.T.U. during the war when "supply" rates were accepted.

Building Trade Analogy

Building trade workers employed in the electricity supply industry are separately dealt with and the E.T.U. claims the same for its members. The B.E.A. has offered to consider the setting-up of a special sub-committee, with preponderant E.T.U. representation, to deal with employees in the contracting departments. Although the Court says that it does not consider the cases analogous it thinks that this would be a reasonable way of recognizing the special position of electricians on the contracting side of the industry.

The E.T.U.'s objection to this is said to be that the sub-committee's recommendations would be subject to

endorsement by the whole of the N.J.I.C. for the Electricity Supply Industry. According to the Court this is " of theoretical rather than practical importance," provided there is " a proper spirit of co-operation and goodwill."

In all this business there is a faint echo of the company union *versus* craft union question of which much was heard in the United States some years ago. It is convenient for the B.E.A. and Area Boards to have all the negotiating " machinery " within the electricity supply industry but the arrangement is likely to prove unacceptable to a craft union having members engaged on similar work on both sides of the nationalization fence. The E.T.U. hopes that one day all electrical contracting work will be in the hands of the Electricity Boards but even that consummation (may it be far distant!) would not solve the present problem. Obviously there must be a compromise and the Court's view is that the sub-committee arrangement suggested by the B.E.A. is a reasonable one.

NATIONAL FUEL POLICY

Whatever may be implied in the term " national fuel policy " there is nothing new in collaboration between the quite distinct industries concerned, provided it does not involve interference with the public's right to use the products of any of them. Methods of burning untransportable fines and slurries at colliery power stations connected to the grid are being investigated by the B.E.A. and the N.C.B. A notable recent case of co-operation is the use of a one-to-three coke-breeze and coal mixture at the new West Ham " B " station. The breeze, which has next to no commercial value, comes from the adjacent works of the London Gas Board and so does not involve any transport charges. The boiler efficiency is thereby lowered by only 0·5 per cent.

" SPINNING RESERVES "

Comparisons between generating capacity installed in 1939 and to-day understate the seriousness of the present position in at least one respect. The great majority of turbo-alternators in use (about 250) are rated at 30 MW for maximum continuous duty, but 24 MW for greatest fuel economy. This practice was confirmed in 1947 by a Standardizing Order (since repealed) for units of that capacity. The margin of 6,000 kW provided a " spinning reserve " to cope with short peaks and breakdowns. Now that plant has to be run " all out " the margin is lost and thermal efficiency is reduced. Otherwise the kW difference between the two ratings would in the aggregate go far towards meeting the increased demand on the coldest days.

THE REHEAT CYCLE

Prevailing conditions in the United States are more favourable to extended use of interstage reheating of steam between high- and low-pressure sections of turbines than they are in Great Britain, where it originated at North Tees power station more than 30 years ago. According to the G.E. Company of America, reheat units accounted for 9·5 per cent of the total kW capacity built in 1949 and 26·5 per cent in 1950. At the Dunkirk power station of the Niagara Mohawk Power Corporation a new design was put into service last year. Both initial and reheated steam are admitted in the middle of a single double-flow high-pressure casing so as to avoid the high temperature gradient when steam is returned near the high-pressure exhaust.

RAILWAY CABLES

The normal manner of supporting power cables alongside the tracks of electrified railway lines is involving the use of such great numbers of short concrete posts that thought has been given to the laying of such cables in troughing instead of hanging them on post-racks. The desired reduction of expense might more effectively be brought about by the employment of aluminium sheathed cables. Their lesser weight permits them to be supported at greater span widths, of the order of yards instead of feet, so that fewer posts would be needed.

" THE CHESTERS "

It is evident, even at this early stage in the development of " The Chesters " residential estate, to which further reference is made on another page, that the planners of this splendid scheme will be completely justified. It is a tangible expression of reverent gratitude to those members of the I.E.E. who sacrificed their lives in the war. Only those who have visited the tenants now in occupation can know how fully the hope of the Court of Governors is already being fulfilled.

Multi-head turning equipments are included in the second crank machining section

Cycle Components

Electrical Aspects of Comprehensive Material Handling Scheme

ONE of the most interesting works reorganization schemes we have seen is that at the cycle components factory of Walton & Brown, Ltd., at Handsworth. The reorganization of the works as a whole is not yet completed; it relates mainly to the production of chain wheels and cranks, frame lugs, bottom brackets and fittings, axles and head fittings. The work of modernization has involved changes of machines, and this in turn has resulted in almost all cases in the conversion of group driving via overhead line shafting to individual driving. But the main contribution to the modernization of the works has been the complete re-equipment of all the departments to afford in very large measure continuous flow

In the crank machining section there is a line of machines on each side of each bank conveyor; four-spindle twin-head inclined equipments at delivery end

production where there had been previously batch production.

An essential part of the new production layout has been the introduction of modern methods of material handling. Before the introduction of the present wider scheme, drawings were prepared of an alternative reorganization plan which did not incorporate major material handling methods, and whereas in that case 60,000 sq ft of floor space was required for one large section of the works, under the new scheme for the same production less than 30,000 sq ft of floor space is needed.

Contributory to all the foregoing has been the special attention paid to time and motion studies in drawing up the scheme as a whole. Already there have been considerable increases in production in the departments so far modernized, and there is ample evidence that when the reorganization of the factory as a whole has been completed the work outlined in this article will have been more than justified.

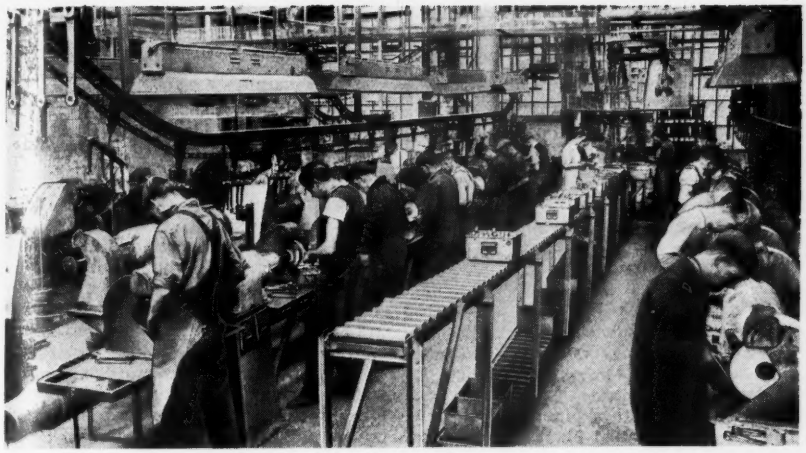
Let us now more directly describe the plant and processes in those sections of the works which have already been dealt with. In the crank machining section, which was previously operated on the batch production principle, there are four identical lines of machines, one line on each side of two band conveyors. Briefly the operations along these lines are grinding, drilling, reamering and profile machining. Each grinder in the foreground is driven by an incorporated motor with belt transmission from both ends of the shaft and step-up change speed pulleys giving final speeds of up to 2,200 r.p.m. Next in the line is a group of four-motor directly coupled 1,420 r.p.m. Alfred Herbert vertical drilling machines. The transmission in each embraces mechanical speed variation and reversing. The conveyor is driven from the delivery end and there is worm gear transmission on to the conveyor end drum giving a belt speed of about 12ft/min.

At each machine, cranks are ploughed off the conveyor into a conveniently placed tray from which the operators can remove the components for machining, after which they return them to the band direct, to be ploughed off again at the next machine down the line. The advantages over the old system are that each operator has always work at hand for immediate attention, no labour is involved in man-handling work between the operations, no time is lost in seeking containers for the machined work and a continuous even flow of work is assured at the end of the section.

Two machines at the delivery end of the same line are four-spindle twin head Adcock and Shipley drilling equipments. In each case two motors fixed at an angle of 45 deg operate on to an inclined indexing (work) table. Transmission to twin spindles on each head is through gearing.

From the wire mesh internal conveyor of the washing machine cranks are loaded on to an overhead chain conveyor which takes them to the polishing machines

Following the first crank machining section there is a gap at the moment in the modernization scheme, but eventually the machined cranks will be conveyed by an overhead mono-rail to polishing machines, thence to a barrel tumbling department on pallets by means of a manually operated overhead rail and hoist. A battery of 44 barrelling machines is group driven by a 25 h.p. motor mounted in the roof



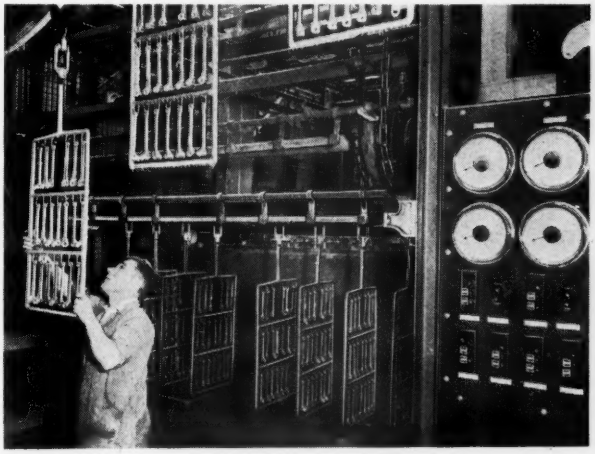
Overhead chain conveyors from the washing machine follow the lines of polishing machines between which is a gravity roller track

girder system. Transmission is first through a 7 to 1 ratio speed reduction belt scheme and then via subsidiary belts to the line shafts.

After barrelling, pans of cranks are passed from machine to machine in a second machining section on gravity roller trucks. Machines in this section are mainly tapping and special purpose turning equipments, including multi-head turning machines in each of which a 3 h.p., 1,430 r.p.m. motor serves five stations on a rotating work table. There is a smaller motor for indexing and clamping. The work is next passed through an automatic washing machine on a wire mesh band conveyor. During its passage through the washing chamber the work is subjected to sprays of hot cleaner solution. The mesh conveyor 1 h.p., 960 r.p.m. motor serves transmission gear which results in a conveyor speed of 16 in/min.

The cleaned cranks are loaded on to an overhead continuous chain conveyor which follows two lines of polishing machines. This conveyor is driven by a horizontally mounted motor with transmission through belt and worm gear to a vertical shaft with a sprocket wheel at the bottom giving a chain conveyor speed of 30ft/min. Between

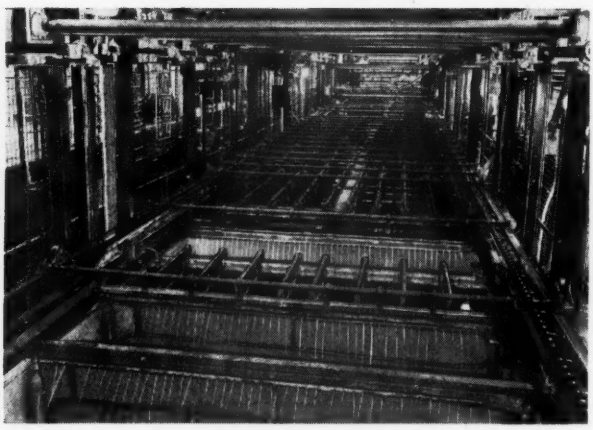
The work is loaded on to plating jigs which are carried on flight bars through the plating plant; note plating plant remote control panel



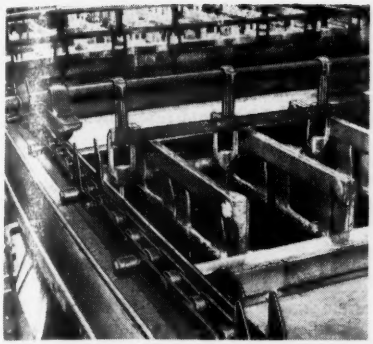
the polishing machines is a gravity roller track which carries the polished cranks away to an inspection section. As the work on the chain conveyor passes each machine the operator lifts it off the conveyor hook and later places it on the roller track. Each Canning polishing machine has two 2 h.p., 2,870 r.p.m. motors in a common frame, each motor serving one polishing head. From the inspection station the work is again transported by overhead chain conveyor to the completely new and particularly comprehensive plating shop. In this new shop there are aligned two new automatic plating plants—one for nickel and one for chromium—each provided with the required complement of cleaning and plating vats. The work is loaded on to plating jigs which are carried on flight bars through the plating plant.

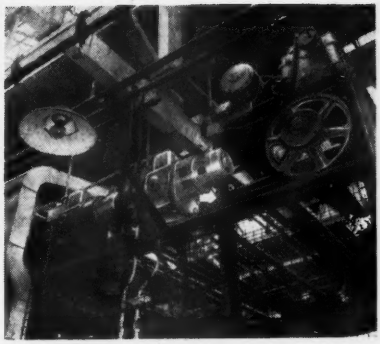
In the nickel plating plant the sequence of vats from the feeding end to the delivery end is: hot cleaner, cold swill, warm swill, acid etch, cold swill, cold swill, nickel plating, cold swill, hot swill. Of these vats the hot cleaner, acid etch and nickel plating ones are equipped electrolytically, and in the acid etch vat the work is the anode. In the case of the hot cleaner and the nickel vats the positive busbars connect directly with the fixed anodes and the return from the cathode (work) is via shoes and a length of track above the tank at the side. In the case of the acid etch vat, however, the current is reversed by a positive busbar connection to another pair of live rail sections which raise the flight bars above the negative track. Work is carried round on the flight bars by a pair of overhead chain conveyors with suitably placed dogs. The chain on the nickel plant is driven by a 3 to 1 h.p., 1,380 to 610 r.p.m. motor with transmission through a gear box with a 368 to 2 speed reduction ratio. Then there is dual transmission on to an end sprocket wheel and the final speed of the chain is 1ft in $1\frac{1}{3}$ minutes. The flight bars are lifted and lowered as required under separate time switch control. When the work is in the elevated position it is carried on by a pair of bars which are driven forward by a set of motor driven pinions which engage racks on the bars. The lifting on the nickel plant is provided for by a 3 h.p., 1,425 r.p.m. motor. There is double transmission, in each case through a very wide ratio gear box and a worm and pinion to the sprocket wheel. A shaft across the plant repeats the final transmission on the other side of the plant. The overall reduction ratio is 300 to 1 and the 4ft lift is completed in 9 seconds. The cycle of lifting and lowering is controlled by limit switches, the complete cycle time for lifting, traversing both ways and lowering being 40 sec. The traverse drive is by a 2 h.p., 1,425 r.p.m. motor. Transmission is first through a gear box on to a shaft and then through a loose sprocket with a fixed knocker on to a pinion which engages a rack. The traverse is completed in 10 sec.

In the nickel plating plant the sequence of vats from feeding end to delivery end is: hot cleaner, cold swill, warm swill, acid etch, cold swill, cold swill, nickel plating, cold swill and hot swill



Each of the plating plants is arranged in two sections—dull and bright in the case of nickel and both bright in the case of chromium. Each section of the chromium plant is supplied by a bank of four transformer-rectifiers served by one "Breco" transformer with an input of 70 A at 440 V. The output of the bank is 4,000 A at 8 V. Each section of the nickel plant is





Left: **In the acid etch vat the current is reversed by a positive busbar connection to another pair of live rail sections.** *Right:* **The nickel plant chain drive (top right) has transmission via a 368 to 2 ratio gear box and thence chain to an end sprocket wheel; note also lifting and traverse drives**

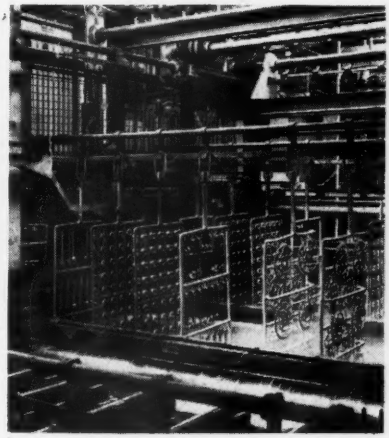
supplied by two banks of three transformer-rectifiers (total output 7,000 A at 8 V). These banks are supplied by two intermediate transformers (1,800 A at 15·7 V) and these, in turn, by a "Breco" transformer with an input of 150 A at 440 V. Following the same principle, but with variations in the voltage reduction stages, the other electrolytic sections are similarly supplied from transformer-rectifier banks. The output for the cleaner vat is 1,500 A at 8 V, while that for the acid etch vat is 3,000 A at 8 V.

Connections from the rectifiers to the anodes and cathodes are solid by means of very heavy section aluminium busbars. The chromium and nickel plating plant transformers are remotely controlled in each case from a ground level control board at the end of the particular plant. On this control board the conveyor motor button serves as a master controller for all the other motors in the particular plant, while also controlled from the same station are the voltage, exhaust air pump and other auxiliaries. The acid etch and cleaner vats are hand controlled locally.

Practically all the work which passes through the plating shop is treated in both the nickel and chromium plating plants and in that order. Associated with the plating plants is a comprehensive material handling system which in fact embraces five separate overhead continuous chain conveyors, but in their operations these conveyors are all interdependent. Around each plating plant is an endless conveyor, and at the plant loading end in each case the operator lifts the jigs with their components from the conveyor and passes them on to the flight bars ready for their passage through the plant. At the other end of the plant the operator removes the jigs from the flight bars and hooks them on to the same chain conveyor. Each of these plating plant conveyors runs alongside a loading station and an unloading station, so that there are four such stations in all.

We have already referred to the conveyor which serves the plating plant from the polishing section. This is the third of

The traverse drive has transmission through a loose sprocket with a fixed knocker on to a pinion which engages a rack



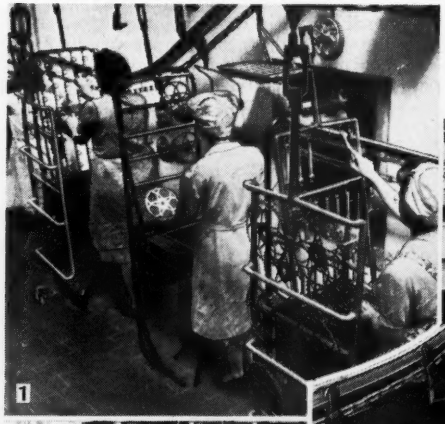
five plating shop continuous conveyors. It also runs alongside the loading station of the nickel plating plant, and it is through this station that the conveyor around the nickel plating plant is served. Through the unloading station of the nickel plating plant is fed the plated work from the conveyor around the plant to a fourth conveyor of the five systems. This serves a battery of mopping machines, mopping being an intermediate operation between nickel plating and chromium plating. This fourth conveyor also runs alongside the loading station of the chromium plating plant, and through this station the conveyor around this plant is fed with the jigs. The fifth conveyor runs through the warehouse and also alongside the unloading station of the chromium plating plant through which station the warehouse conveyor is fed from the conveyor surrounding the plant.

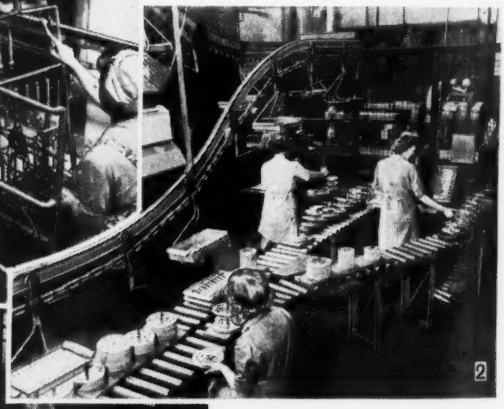
In the warehouse a part of the fifth conveyor runs immediately over part of a roller conveyor serving power and air presses used for final assembly.

All these plating plant overhead conveyors are similarly driven, and in each case a small motor transmits through gearing with a very wide speed reduction ratio. The assembled components are then placed on a short belt conveyor alongside which operators are at work on spinning, assembly operations and packing the assemblies passed on to them. Each spinning machine is drive by a vertically mounted 3 h.p., 1,425 r.p.m. motor.

All the conveyors associated with the new and modernized plant were supplied by the New Conveyor Co., Ltd.

We are indebted to Messrs. Walton & Brown, Ltd., for permission to visit the Handsworth works and to publish this article.





(1) Each of the plating plant conveyors runs alongside a loading station and an unloading station

(2) In the warehouse part of the fifth plating shop conveyor runs immediately over part of a gravity roller conveyor serving final assembly

(3) A particularly notable production increase has resulted from the simple modernization of this final operation plant

Power Line Design

Overhead Transmission in West Bengal

By MANORANJAN DATTA, PH.D., M.SC.

OVERHEAD line design is generally governed by regulations that lay down safety factors, loading conditions, ground clearances and similar limitations, and make various provisions relating to road crossings, telephone interference, etc. The conditions at present specified for the Province of West Bengal in the Indian Union* are briefly as follows: (1) no ice loading; (2) temperature range, 50 to 130 deg F; (3) wind pressure (horizontal), 20 lb/ft² calculated on two-thirds of the projected conductor area; (4) safety factors: (*a*) for conductors (under conditions of maximum loading and minimum temperature), 2; (*b*) for metal supports (wind pressure 20 lb/ft² on 1½ times the area of one face of the support), 2·5; (*c*) for guard or bearer wires, 3; and (5) minimum height of conductors, 20ft from the ground at any point in the span at 130 deg F.

The loading conditions in Bengal are not only less severe than in Britain, but there is also less difference between the loaded and unloaded conditions. The minimum safety factors specified are, however, those of El.C.53 for Britain. This would appear to be unreasonable.

Proposed Modified Regulations

The loading conditions adopted by the various Indian Provincial Governments have been criticized as irrational and further consideration has been recommended with a view to reducing the cost of transmission lines†. In Britain, too, as the result of extended experience, suggested modifications of the present code—El.C.53 (1947 revised)—have been published‡ to elicit criticism before the preparation of a final draft. The object of the proposed amendments in the British regulations is to reduce the capital cost of lines by simplifying construction and reducing ground clearances, without affecting public safety. Examples are:

(a) *Minimum Ground Clearance:* this is 17ft for 11 kV lines and 20ft for lines up to 66 kV, except at road crossings where the respective clearances are 19 and 20ft.

(b) *Earthing and Bonding:* the new regulations would permit non-earthed metalwork on wood poles.

(c) *Road Crossings:* it would be unnecessary to provide special constructions. Road crossings would be normal spans, subject to the use of insulators of the next higher rating to those recommended in Table 2 of B.S.137 : 1941 for the appropriate line voltage.

(d) *Factors of Safety:* the suggestion is to drop the term " factor of safety " for overhead lines. An empirical formula has been proposed for tensioning line conductors. Such tension is not to exceed 75 per cent of the breaking load at 22 deg F, instead of 50 per cent as hitherto.

It is noteworthy that the Indian Central Electricity Commission is considering the standardization of wind pressure and temperature range for a simpler line design and construction.

Conditions in West Bengal

When planning a regional electrification scheme for West Bengal it is necessary to consider the appropriate local climatic and geographical conditions. Table I gives the normal variations of temperature and the wind velocity to be expected month by month: the figures represent the extremes observed over a seven-year period (1941–47) compiled from records of the Meteorological Department at Alipore, Calcutta (22° 32′ N; 88° 20′ E; height 20ft).

* Indian Electricity Rules, 1937, of the Central Electricity Commission, Government of India Press, New Delhi.

† COVENTRY, A. F.: " Some Notes on the Design of H.V. Transmission Lines, with special reference to Conditions in India and Pakistan," Proc. I.E.E., 96 (II), p. 521 (1949).

‡ GRIMMITT, H. W.: " Overhead Line Regulations," Proc. I.E.E., 96 (II), p. 673 (1949).

TABLE I.—TEMPERATURES AND WIND VELOCITIES

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Shade temp., deg F												
maximum.	89	94	106	108	108	109	95	97	96	95	92	86
minimum.	47	49	57	66	69	74	75	75	75	67	55	47
Addition for sun temp., deg F	55	61	63	62	66	71	71	67	66	67	62	65
Maximum wind vel. m.p.h.	45	44	53	62	80	67	69	57	41	67	34	28

Table I indicates that the normal range of variation of shade temperature is 47 – 109 deg F. The corresponding sun temperatures are 47 + 55 = 102 deg F in January and 109 + 71 = 180 deg F in June. Thermal ratings of transformer and feeder equipments need to be reduced considerably in view of such high ambient temperatures.

The recorded maximum wind velocities occurred in summer months for all the years examined. Meteorological records also show that, for the same years, on only three days did the maximum velocity exceed 70 m.p.h., and that only for a few minutes. The normal wind velocity seldom exceeded 30 m.p.h. The effective wind pressure on a plane surface may be obtained from $p = 0{\cdot}0032u^2$ lb/ft² for a wind velocity u m.p.h. In calculating pressure, only the projected area of the surface need be taken, and for circular conductors this is reduced to two-thirds of the projected area on account of the streamlining of the air flow. For the maximum recorded velocity of 80 m.p.h. the wind pressure is 20·5 lb/ft² and for 30 m.p.h. it is only 2·9 lb/ft². It is to be noted that the worst wind load does not occur at times of minimum temperature when the conductor stress is high, but in summer when sudden squalls of short duration may occur. During the low temperature period the wind loading is relatively light.

Modified Tension Formula

The conductor length L_1 for a half-span l at maximum-loading conditions (130 deg F and 20 lb/ft² wind pressure for West Bengal) is given by:

$$L_1 = l + w_1^2 l^3 / 6T_1,$$

where w_1 is the total resultant conductor loading and T_1 is the tension*. Let the line be strung in still air at a tension T_2, the conductor loading then being its weight alone, w_2; and let the temperature be lower than 130 deg F by θ degrees. Then the fall in temperature causes a contraction in the half-span conductor length of $\theta\alpha L_1 \simeq \theta\alpha l$, where α is the linear-expansion coefficient; while the reduction of tension due to reduced loading causes a further decrease of length of $(T_1 - T_2)L_1/aE \simeq (T_1 - T_2)l/aE_2$, where the conductor area is a, and E is its elastic modulus. Thus the conductor length under stringing conditions is: $L_2 = L_1 - (T_1 - T_2)l/aE - \theta\alpha l$. For British conditions, where maximum loading is at minimum temperature the sign of the last term on the right-hand side is *positive* and this makes a marked difference to the stringing tension.

Example: Consider a 400ft span with a 3/·147in conductor (0·05in² copper equivalent). The conductor weight is 0·20 lb/ft, the windage is 0·53 lb/ft and the resultant load, including maximum wind pressure, is 0·57 lb/ft. The breaking load is 2,920 lb and the safe working tension is taken as one-half of this, namely, 1,460 lb. The elastic modulus is 18×10^6 lb/in² and the coefficient of linear expansion is $9{\cdot}2 \times 10^{-6}$ per deg F. Using these figures, the stringing tension has been evaluated for both formulæ, the results being given in

TABLE II.—TENSION AT ERECTION IN STILL AIR

Erection temp., deg F	130	110	90	70	50
Tension, lb:					
Normal formula	590	640	710	780	870
Modified formula	870	980	1090	1220	1350

Table II. The considerably increased tension allowed by the modified formula means that the lines may be stressed to a much reduced sag, with consequent economies in support heights.

With the increased tensions permissible, particularly if steel-cored aluminium conductors are substituted, it is probable that vibration-dampers would be required.

* STARR, A. T.: *Electrical Power*, 1937 edn., p. 59, Pitman.

E.I.B.A. Annual Meeting

THE annual general meeting and Council of the Electrical Industries Benevolent Association will be held on 13th July at 11.30 a.m. in the offices of the Institution of Electrical Engineers, Savoy Place, London, W.C.2.

E.D.A. Sales Conference

Summaries of Papers

THE 1951 Sales Management Conference of the British Electrical Development Association was opened on Tuesday last at Caxton Hall, Westminster, S.W.1, by Mr. H. J. Randall (chairman of the London Electricity Board). Seven papers have been presented during the Conference, which ends to-day (Friday) with the customary luncheon at the Connaught Rooms, London. The chairmen at the various sessions have been Dame Caroline Haslett, Mr. H. C. Waters (deputy chairman, Eastern Electricity Board), Mr. W. S. Sawtell (deputy chairman, S.E. Scotland Electricity Board), Mr. H. Nimmo (chairman, Southern Electricity Board), Mr. V. W. Dale (E.D.A.), Mr. S. F. Steward (chairman, South Western Electricity Board), and Mr. R. A. S. Thwaites (deputy chairman, North Western Electricity Board).

Electricity and Hygiene

The first paper, on " Food Hygiene and the Part Electricity can Play," was by Mr. H. T. Perry, O.B.E., F.S.I.A. (chief sanitary inspector, Kingston-on-Thames). Mr. Perry dealt with the general principles which should govern the installation of equipment. He spoke of the adaptability of electricity as a source of illumination, the suitability of electric steam producing plant for utensil sterilization, and the advantages of thermal storage water heaters for providing adequate supplies of hot water.

Referring to food preservation, he said that there was scope for further investigation into possible improved methods of food storage and food processing, e.g., quick freezing and sterilization. There was a need for both efficient collection of atmospheric dust, and for air-conditioning in food rooms. As a motive power in the food industry electricity had no equal, among its many applications being electrically operated packaging machines and electronic and other devices for inspecting, counting and the rejection of defective packages. The use of electrically operated washing-up machines was being extended and Mr. Perry spoke of some of the types and designs available. He also covered the application of electricity in the bakery and advocated the wider use of electromagnets for the extraction of ferrous metals from flour, dried fruits, etc., and suggested the possibility of using X-ray or electronic detectors for discovering other types of foreign matter in food. Electric furnaces provided a safe and speedy means of incineration in food factories.

Industry and the Public

The cultivation of public goodwill was dealt with by Mr. P. Honey, A.M.I.E.E. (E.D.A.) in a paper on " Co-operation with Professional, Trade and Other Organizations." One of the most effective ways of developing good relations with the public was through those organizations which, taken as a whole, helped to mould public opinion. As a national association representing a nationalized industry, one of E.D.A.'s tasks had always been to keep constantly in touch with those sections of society which might affect the development, prestige and well-being of the industry it served. The Association was in close contact with Government Departments, and with all the principal professional, trade and social organizations.

People were often influenced by the published views of responsible organizations, and any pronouncement by such institutions touching on electricity, its supply and use, had to be carefully watched and steps taken to safeguard the interests of the industry. There were many other directions in which public relations could be developed. Individual contact with education officers, headmasters and other teachers was of first-rate importance, while frequent contact with journalists helped to keep them more fully informed and would result in more objective reporting of electrical matters.

There were over 1,500 organizations covering a wide field of culture, science and industry, and there were enormous possibilities for co-operation with those whose

interests impinged on the industry's. Some of them, such as the architectural institutions, had branches in every part of the country. Area Boards, at all levels, could usefully cultivate them in their own districts. The extension of public relations towards these organizations would be chiefly in the offer of help in the way of lectures, film shows, or demonstrations. An appendix to Mr. Honey's paper gave the names of organizations whose interests might coincide to a greater or lesser extent with those of the electricity supply industry.

Lighting Opportunities

The opinion that the supply industry as a whole had under-rated the importance of the interior lighting load, and that its continued neglect could only harm the long-term prospects of the industry, was expressed by Mr. W. Robinson, B.Sc., A.M.I.E.E., F.I.E.S. (E.D.A.) in a paper on " Lighting Opportunities." Lighting standards in this country were far below those commercially and technically possible and socially desirable. North American lighting consumption—estimated at 80,000 million kWh—was some eight to ten times that of this country for a population only three times higher. American recommended illumination levels were more than twice ours, since they had adopted the criterion of 95 per cent optimum visual performance against our 90 per cent.

The author suggested a policy of lighting development based on impartial lighting advice to all consumers without expectation of immediate commercial returns. A good start could be made within the present resources of the industry, by making greater use of service centres and sales staff; when conditions permitted, the employment of interior lighting engineers would be justified by the potential rewards from all fields of lighting service.

Approach to the Farmer

In a paper on " Agriculture, Education and Electricity," Professor H. G. Robinson, M.Sc. (Director of the School of Agriculture, Nottingham University) set out the difficulties confronting the farming community in the face of the need to make this country more self-supporting in the matter of food. He considered that the hope of the future lay in two directions. First, the economics of the farming industry should assure the interest of people with a keen sense of values and secondly education was playing an important part in the development of technical knowledge, as well as giving those entering the industry a better understanding of farming economics.

Agricultural teachers now regarded electricity as essential for easing the problems and burdens of farm and home alike and little salesmanship was called for once interest had been created, but economics must dominate electrical development on the farm.

The modern farmer was different from the popular conception and those who would do business with the farming community should not only be interested in farming but understand the farmer's everyday problems. There was a wide field of opportunity for the staffs of Electricity Boards who were concerned with farm electrification to develop this understanding. Advice and recommendations should be appropriate to the particular case, which meant ability to discern different circumstances when they arose.

Those responsible for farm electrification developments could not afford to be less well-prepared for their job than others who had something to sell to farmers.

Mechanical Handling and Productivity

Ways in which materials handling could be improved were considered by Mr. L. Landon Goodman, B.Sc. (Eng.), A.M.I.E.E., A.M.I.Mech.E. (E.D.A.) in a paper on " More Mechanical Handling as an aid to Greater Productivity." The importance of this aspect was underlined by the fact that materials handling might account for between 15 and 85 per cent of the cost of production of an article.

The problem was an urgent one if we were to maintain our export trade, re-arm and keep up a reasonable standard of life at home as well. The ideal method would be a centralized " pool," with local centres, of materials handling engineers who could act as consultants. This " pool " could be under the auspices of a Government Department or subsidized by the Government.

In place of this ideal, if it were not immediately attainable, the author suggested that the Area Electricity Boards fulfilled the requirement of being in close contact with the smaller industrial concerns. Most mechanical handling equipment was electrically driven, so that the Area Boards had a direct interest in the

use of such plant besides the national consideration of increasing productivity. They could help by appointing materials handling engineers to their staffs or by furnishing firms with a list of those in the area who would be willing to help, though the shortage of men with the necessary experience made this solution somewhat doubtful. Another possibility was that such engineers might be appointed to the staff of E.D.A. to assist the industrial power engineer of any Board; in any case E.D.A. could help by arranging to train chosen personnel on the Boards' staffs.

Radio Frequency Heating

A concise introduction to this subject was provided by a paper presented by Mr. R. Smith, A.Inst.P. (G.E.C. Research Laboratories). Following a brief explanation of heat transference and the generation of heat within an article to be treated, the author dealt with the three main sources of h.f. power—spark gap and valve oscillators, and alternators, explaining that the last could not be used for dielectric materials.

This form of heating was described as principally a method of achieving the rapid through-heating of thick sections of materials of low thermal conductivity; it was also used for the selective heating of assemblies of different dielectric heating.

Induction heating was defined as a method of rapidly heating electrically conductive materials giving pronounced surface heating effects or through-heating; the heat could also be localized.

The next section of the paper was a comparison of heating methods to show how induction and dielectric heating were related to the more conventional methods. The applications of dielectric heating to plastics, rubber, wood, drying, etc., were reviewed, a particularly interesting section being one on the production of plywood.

The uses of induction heaters dealt with in the paper included metal melting, soldering and brazing, the hardening of steel and annealing and tempering.

In concluding, Mr. Smith gave a brief general indication of the capital and running costs of these methods of heating. He warned his audience that in considering any new industrial use of h.f. heating it was advisable to investigate the economics of the process first and the technical problems second; in this they could obtain the assistance of the makers of the heating equipment.

Wrought Non-Ferrous Metals Productivity

MANUFACTURING technique in the wrought non-ferrous metals industry is discussed in the report of a productivity team which visited America last year. The report (price 4s 6d), published by the Anglo-American Council on Productivity, records the general view that while productivity is definitely higher in the United States, quality of product is certainly no better.

In making recommendations to improve the rate of production of castings, it is noted that some British factories have already adopted similar measures and can show a rate of output at least equal to that achieved in the U.S. works visited. Higher productivity is largely due to a high power-input in the electric melting furnaces. Further, the Americans possess a better type of furnace refractory material which permits the handling of a greater range of alloys than is usually the case in our own country.

In rolling, the initial slab is, on the average, much heavier than in this country and the resultant coils permit of more continuous rolling. With regard to extrusion, the team's impression was that the timing of all operations was so synchronized that no effort was wasted and no time lost, but the number of men in a gang was no fewer than on similar presses in this country. In wire drawing the processes did not greatly vary from those in Britain and no new major techniques were observed in tube drawing, though the unrelenting attention to possible improvements was indicated by the numerous simple gadgets, fittings, minor alterations, etc., on conventional plant.

Materials Handling

THE Anglo-American Council on Productivity has issued "Materials Handling in Industry," a pamphlet version of the productivity report published by the Council under the same title a year ago. Illustrations are numerous, some being taken facsimile from the original report. The pamphlet is issued at the nominal price of 6d and is obtainable from the Council at 21, Tothill Street, S.W.1. Bulk supplies are available on reduced terms.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Tariff Standardization

THE South Western Electricity Board is about to introduce a new domestic tariff—one tariff for all domestic consumers in the whole area. Consumers will no longer be able to choose the tariff most suited to their requirements nor is there to be any tariff inducement to increase diversity or to fill the valleys in the load curves. Surely the value of different tariffs developed by municipal and company engineers over the last 30 years cannot have been forgotten?

The present aim at uniformity must tend towards less diversity and an aggravation of the peak load problem. Tariff uniformity may be convenient to the operating authority but I submit that the skill and ingenuity which, in the past, supply engineers have shown in developing tariffs was neither pointless nor ineffective. In particular, it is essential that off-peak and particularly night loads should be increased as soon as possible.

It might have been expected that any new tariff would have, as one of its principal aims, the reduction of the peak load problem, the Achilles heel of the B.E.A. if not of the Boards. It must be very disappointing to many who have given a lifetime of service to the supply industry to find the lessons of experience being ignored.

West Town, nr. Bristol. R. H. COBBOLD.

Water Heating

FROM your issue of May 11th (p. 1009) I learn of yet another instantaneous water heater which appears to perform miracles. Every so often one of these super-efficient devices is invented and I always wonder what new principle has been discovered.

This time the claim is for $1\frac{1}{4}$ pints of boiling water in 60 sec with 3 kW loading. Assuming the usual inlet water temperature of 60 deg F the heater must operate at 140 per cent efficiency. How is it done? If we credit the device with an efficiency as low as 100 per cent we must needs feed it with inlet water at 103 deg F. From where is this nice hot inlet water obtained?

How vexed must be the established water heater manufacturers, who can achieve only $\frac{7}{8}$ pint of boiling water in 60 sec with 3 kW loading from the ordinary cold water supply!

Frampton Cotterell, nr. Bristol. S. F. BICKELL, M.I.E.E.

Hotplate Interchangeability

I AM at a loss to understand why there should be any doubt as implied by "Ich Dien's" letter in your issue of 11th May as to the approved connections for single circuit boiling plates.

Ever since the E.D.A. Specification for the Interchangeability of Replacement Parts for Electric Cookers was first issued it has contained the requirement that in a single-circuit boiling plate the connections shall be made to the two pins at the ends of the standard row of four.

London, W.C.2. V. W. DALE.

Load Control

IN his letter of 4th May on load control, Mr. P. J. Squires made clear the limitations of frequency sensitive relays for load shedding purposes, but his statement that "*any* load controlling device does not provide a solution to the plant shortage since it can only offer an alternative means of cutting off load" is too sweeping. Surely plant shortage is only evident at periods of national peak, and if the transfer of certain loads from the "peak" to the "off peak" period could be effected, it would alleviate the conditions which have necessitated, hitherto, the drastic "cuts" industry, commerce and housewives have had to suffer.

Centralized ripple control has been evolved for effecting such load transference and it should not be looked upon purely as a means of cutting off load at peak times, but more as a scientific aid to building up

the right type of load and increasing the total usage of electricity. Besides providing a solution to the existing plant shortage it is a permanent adjunct to the efficient and economic operation of generation and distribution at all times because it enables the load factor to be improved and additional load to be accepted without embarrassment. What is more, signals available with ripple equipment are applicable to other services, e.g., street lighting, shop window lighting, etc., favourably influencing the economics of its installation, improving operational characteristics and reducing the maintenance charges on these services. It has frequently been found economic to provide ripple control for street lighting alone.

Finally, ripple engineers believe that the 70 per cent of load shedding by voltage reduction in the past four months—referred to by Mr. Squires—could have been avoided by "load transference," and that any further shedding could then have been achieved by voltage reduction. Thus total disconnection in these cases would have been avoided.

Liverpool, 7. F. M. DE BORDE,
Associate I.E.E.,
Ripple Control Engineer,
Automatic Telephone & Electric Co., Ltd.

Portable Tools

IT is well known that portable electric drills are fairly frequently the cause of fatal accidents, and this I believe to be largely due to the fact that these drills have a metal hand-grip.

The use of a 100 V double-wound transformer with centre tap earthed is a great safeguard, but it is expensive and unless there are statutory regulations to enforce its use it will be many years before this becomes a predominant method.

Assuming the operator's feet or left hand to be partially earthed, the finger-tip touching a live object produces a current through the body of the order of 10 mA or so, which represents an unpleasant shock, but not as a rule a fatal one; whereas if the live object is gripped firmly in the palm of the hand normal mains voltage will frequently give a fatal shock, partly because the grip cannot be released.

I suggest it should be possible to produce an insulated handle and trigger switch on a portable drill which would be sufficiently tough to stand up to hard usage, but would nine times out of ten protect the user against a fatal shock in the event of failure of the earthing arrangements to the body of the machine, which seems so common with these tools.

Weymouth. K. ORCHARD.

P.S.—The opinion expressed above is a personal one and does not represent in any way the policy of the Southern Electricity Board.

Human Values in Nationalized Electricity

IN his contribution to your issue of 18th May "Fiat Justitia" must have echoed the thoughts of many fellow engineers who also have not failed to observe the high salaries offered for the large number of advertised clerical situations within the nationalized electricity supply industry.

A further anomaly is with regard to the more general question of advertised technical vacancies for which the manufacturing industry provides a valuable field for recruitment. Any application should be treated by the authorities as a confidential negotiation between themselves and the applicant, the only considerations being the suitability of the applicant for the duties to be undertaken commensurate with the salary offered. If a third party is brought into or allowed to influence the negotiations, usually without the knowledge and certainly without the consent of the applicant, the obvious result is that the best men will be by-passed and the nationalized electricity supply industry will be built up with men that the manufacturing industry do not wish to retain. Is it by such men that the technical vacancies are filled? FAIRPLAY.

LIGHTING PLANS

THE Minister of Transport has approved the installation of 57 sodium vapour and 24 tungsten filament lamps to replace the existing gas lighting on 1½ miles of Dewsbury Road, LEEDS.

GAINSBOROUGH U.D.C. has applied for sanction to borrow £3,050 for installing electric street lighting in Beaumont Street and Trinity Street, the only main highway in the town still gas-lit.

LOUGHBOROUGH Town Council is to borrow £9,000 to convert the remaining gas street lamps to electricity.

VIEWS on the NEWS

By REFLECTOR

THERE seems to have been some difference of opinion among the Festival of Britain authorities as to the efficacy of the earthing provided by the steel guys of the "Skylon" at South Bank. During a storm last Friday a surrounding area of 40 sq yd was roped off, it was reported, "by mistake." On the following day, however, access to the area was again prevented in similar circumstances. Apparently officials of the National Physical Laboratory had in the meantime confirmed the opinion that a very slight risk existed of the surrounding ground becoming charged electrically. In view of the large crowds there, it is just as well to be on the safe side and, I understand, the same precaution is to be taken in future whenever the Meteorological Department gives warning of a possible thunderstorm.

* * *

Apart from the usual down-to-earth inquiries made by foreign buyers at the British Industries Fair there are occasionally some which touch upon the supernatural or fantastic. The *Board of Trade Journal* mentions some of these, including a request from a Turkish buyer for a means of photographing ghosts with an ordinary camera and one from an American lady to a hearing-aid exhibitor for a device to enable her to listen-in to what her neighbours were saying about her. Which reminds me of Burns': "Oh wad some power the giftie gie us . . ."

* * *

Before nationalization little was heard in the electricity supply industry of the National Association of Local Government Officers, although it had a good many members among the clerical staffs of municipal undertakings. Now the Association looms large on the "labour relations" side of the industry and to its total membership of something like 200,000 about 15 per cent is contributed by the administrative-clerical side of the B.E.A. and Electricity Board organization. For the first time I had the privilege last week of attending the annual dinner of the National Executive Council of N.A.L.G.O. and was impressed by the varied character of its membership and activities as illustrated on the attractive menu and by the representative company present. Apart from purely local government its members are in electricity and gas supply, hospitals, transport and other fields of public service.

* * *

It was a refreshing change to dine in the hall of the Worshipful Company of Ironmongers instead of a West End hotel which could never attain the same beauty and dignity. Mr. E. L. Riley, the president, was in the chair and the guest of honour was the Rt. Hon. Hilary Marquand, Minister of Health. One of the toasts was "Electricity, Gas and Transport Industries" ably proposed by Mr. W. Strother, A.M.Inst.C.E., junior vice-president. For gas Col. H. C. Smith, deputy chairman of the Gas Council, responded in an amusing and quite unbiased speech and the spokesman for electricity was Mr. David Moffat, the B.E.A.'s director of establishments. Mr. Harold Clay (Road Haulage Executive) replied for transport. Mr. Marquand replied to the toast "Local Government and the National Health Service" proposed by Mr. L. Bevan, senior vice-president.

* * *

Historical evidence of initial dates of scientific achievements is too often unsatisfactory because of lack of ocular proof. This seems to me the value of scraps of paper like the one recently presented to the Science Museum by Mr. P. J. Woodward. This is said to be the first transatlantic wireless signal to be tape-recorded. It was received on 5th December, 1902 at Poldhu, Cornwall, by Mr. Woodward, then on Marconi's staff, from the new transmitter installed on Cape Breton Island, Nova Scotia.

PERSONAL and SOCIAL

News of Men and Women of the Industry

The Southern Division, British Electricity Authority, has appointed **Mr. S. C. Riggott**, A.M.I.E.E., M.Inst.F., A.I.Mech.E., as station superintendent, Cowes generating station, Isle of Wight. Mr. Riggott received his secondary and technical education at Derby, the latter being concluded at University College, Nottingham. He served an apprenticeship in the laboratory and test section of the Chief Mechanical Engineer's Department of the L.M.S. Railway, afterwards being test assistant there until 1930. From 1930 to 1938 he served at Derby power station, after which, until 1941, he was at Thorpe power station, Norwich. In 1941 he was appointed combustion engineer at Roath power station, Cardiff, and became deputy station superintendent there in 1948, holding that position until taking up his new appointment this month.

Mr. T. R. P. Harrison, B.Sc.Tech., M.I.E.E., has been appointed cable systems engineer to W. T. Henley's Telegraph Works Co., Ltd., as from 1st May. He will be responsible to the chief engineer and will be concerned with the technical aspects of extra high voltage cable systems. Mr. Harrison received his technical training at the Manchester College of Technology and joined Henley's in their research laboratories at Gravesend, Kent, in 1925. He has specialized in extra high voltage system matters, and has been largely responsible for the development of the Henley high voltage research laboratories. In 1946 Mr. Harrison delivered a paper before the Institution of Electrical Engineers entitled "The Development of the Gas Cushion Cable System for the Highest Voltages" for which he was awarded the Sir John Snell Premium.

Mr. T. R. P. Harrison

Mr. F. J. Hurn and **Mr. D. W. Barrett** have been appointed to the board of S. Smith & Sons (England), Ltd. Both have been associated with the company for many years, Mr. Hurn as director and general manager of Smiths Motor Accessories and Mr. Barrett as director and general manager of Smiths English Clocks.

Mr. C. G. Abbey, president of Bepco Canada, Ltd., is to visit this country, leaving Quebec City in R.M.S. *Franconia* on 6th June. "Bepco" is a wholly-owned subsidiary of Bruce Peebles, Crompton Parkinson, Harland Engineering and Lancashire Dynamo Holdings, and Mr. Abbey is making this visit to consult with the executives of these various companies. During his stay he will also make an extensive tour of the companies' factories. He expects to complete his trip and return to Canada on 19th July.

Mr. C. G. Abbey

Mr. W. H. Brittain, district consumers' engineer, Buxton, of the North Western Electricity Board, has retired after thirty-three years' service in the electricity supply industry and on 9th May Mr. C. J. Ferguson presented him with an eight-day clock on behalf of past and present colleagues. Before nationalization, Mr. Brittain was electrical engineer for Buxton.

The General Electric Co., Ltd., has appointed **Mr. O. W. Humphreys**, B.Sc., F.Inst.P., M.I.E.E., director of the Research Laboratories of the company. Mr. Humphreys has been the manager of the laboratories for the past two years, having been appointed to that position upon the death of Sir Clifford Paterson. He is a member of the Councils of the British Electrical and Allied Industries Research Association and of the British Non-Ferrous Metals Research Association, and has recently been elected a manager

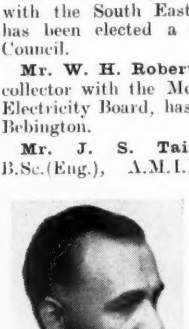
Mr. O. W. Humphreys

of the Royal Institution. Mr. Humphreys serves on various committees of the British Standards Institution and was a member of the Board of Trade Committee of Inquiry into the Organization and Constitution of the B.S.I. which presented its report last year.

Mr. R. Mellor, district manager (Ashford) with the South Eastern Electricity Board, has been elected a member of the Town Council.

Mr. W. H. Roberts, a meter reader and collector with the Mersey and North Wales Electricity Board, has been elected Mayor of Bebington.

Mr. J. S. Tait, Ph.D., A.R.T.C., B.Sc.(Eng.), A.M.I.Mech.E., A.M.I.E.E., who, as we reported in our last issue, takes up the appointment of principal of Woolwich Polytechnic on 1st September next, is at present head of the Electrical Engineering Department of the Northampton Polytechnic, London, E.C.1. He received his technical education at the Royal Technical College, Glasgow, and his training with Glenfield and Kennedy. He also attended a vacation course with the B.T.H. Co., Rugby, and the N.P.L. and later was a lecturer at the Royal Technical College, Glasgow. From 1945 to 1947 he was head of the Electrical Engineering Department, Portsmouth Municipal College, and took up his present position at Northampton Polytechnic the following year. Dr. Tait is a member of the Board of Studies in Electrical Engineering of the University of London, and is the chairman of the board of examiners for the general internal B.Sc.(Eng.) examinations. He is a member of the Ministry of Supply Technical Committee on Servo-mechanisms, and has run advanced courses on this subject at the Northampton Polytechnic, London.



Dr. J. S. Tait

In reporting the retirement of Mr. Frank Nicholls from the managership of the No. 4 (Leeds) Sub-Area of the Yorkshire Electricity Board in our issue of 11th May, we incorrectly referred to **Mr. F. Barrell** as construction engineer of the Yorkshire Division of the B.E.A. Mr. Barrell is generation engineer (construction) of the Yorkshire Division.

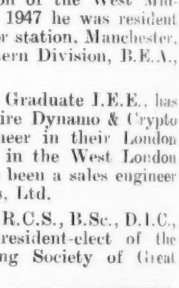
Mr. W. C. Handley, B.Sc.Tech., M.I.E.E., has been elected to the board of British Insulated Callender's Cables, Ltd., as an executive director.

The Minister of Fuel and Power has reappointed the following part-time members of Electricity Boards :—*North Eastern.*—Alderman J. W. Mitchell, J.P. (South Shields); and *North Western.*—Mr. Myles L. Hasselden, B.A.(Cantab.) (Bolton).

Mr. O. S. Woods, A.M.I.Mech.E., A.M.I.E.E., generation engineer (operation), North Western Division of the British Electricity Authority, responsible for the management of nine power stations in Manchester and district, has been appointed chief generation engineer (operation) of the East Midlands Division. He will take up his new duties at the end of this month. Mr. Woods received his general education in Runcorn, Cheshire, and his technical studies were carried out at institutes in Warrington, Rugby and London. Apprenticeship with a firm of switchgear manufacturers in South Lancashire was followed by a further five years' training at the B.T.H. Rugby works. In 1934 he went to Battersea power station, where he remained until joining the London Passenger Transport Board as personal technical assistant to the chief engineer in 1940. From 1941 to 1944 he was assistant resident engineer at the Neasden power station. In 1944, he obtained a similar appointment at Ironbridge power station of the West Midlands J.E.A. and from 1947 he was resident engineer at Barton power station, Manchester, joining the North Western Division, B.E.A., in April, 1948.

Mr. R. K. Griffiths, Graduate I.E.E., has recently joined Lancashire Dynamo & Crypto as assistant sales engineer in their London Office and will operate in the West London area. Mr. Griffiths has been a sales engineer with Johnson & Phillips, Ltd.

Mr. J. G. Holmes, A.R.C.S., B.Sc., D.I.C., F.Inst.P., F.I.E.S., president-elect of the Illuminating Engineering Society of Great Britain, is a glass and lighting technologist, who became interested in both subjects during his student days when he took optics as his subject for research during his third year at London University. His chief interest is on the design side of lighting glass and fittings and he is chief technical officer of Holophane, Ltd. Mr. Holmes has published a considerable number of scientific and technical papers including several in the I.E.S. *Transactions,* and he was awarded the Leon Gaster Premium in 1942. He is a Fellow of the Royal Society of Arts and serves on many B.S.I. Committees.



Mr. J. G. Holmes

Councillor Miss Norah Balls, J.P., of Tynemouth has been appointed vice-chairman

of the E.A.W. National Executive Committee on which she has served for many years. Miss Ball is a part-time member of the North Eastern Electricity Board.

Mr. **R. Mallet**, B.A., M.I.E.E., has been appointed manager of the Worcester and District Sub-Area of the Midlands Electricity Board. Mr. Mallet was educated at Eastbourne College and Cambridge University. After three years' student apprenticeship with the B.T.H. Co., Rugby, he spent a short period as assistant engineer with the L. M. & S. Railway Co., at Euston. His subsequent experience was obtained with the West Cambrian and Carmarthen undertakings, Devonport Dockyard, the Buckrose Light & Power Co. and the South East Yorkshire Light & Power Co. At vesting date he was manager of the Redditch District of the S.W. & S. Electric Power Co. and in May, 1948, he was transferred to the headquarters of the Midlands Board and subsequently appointed deputy chief engineer.

Sir **Duncan Watson**, J.P., M.I.E.E., is retiring from his position of administrative director of Duncan Watson (Electrical Engineers), Ltd., at the end of this month. His London address will be 74, Newman Street, Oxford Street, London, W.1 (telephone, Museum 3821). Sir Duncan was a member of the former Central Electricity Board for many years.

Col. Robert McCreary, M.C., O.B.E., general manager and engineer of the Belfast Transport Department, has announced his desire to retire as from 31st August. Col. McCreary is a native of Ballyclare, Co. Antrim, and was educated at Queen's University, Belfast. He began his service with Belfast Corporation as an assistant engineer in 1912. After serving in the Royal Engineers during the 1914-18 war he rejoined the Transport Department as permanent-way engineer; he became general manager in 1931. Col. McCreary was recalled to the Royal Engineers in 1939 and went to France; he was in the retreat to Dunkirk and in the invasion of Normandy, when he was in charge of the reconstruction of railways in France, Belgium, Germany and Holland. For this he was awarded the O.B.E.

At a recent ceremony Mr. Martin Harvey, chairman of W. T. Glover & Co., Ltd., presented a £50 cheque to each of three members of the company who had completed fifty years' service, including **Mr. H. M. Crellin**, test manager.

The well-known farce, "Rookery Nook," by Ben Travers, was presented by the **Johnson Matthey Dramatic Society** on Friday and Saturday last week at King George's Hall, London, W.1. The complications which arise when a newly married man provides shelter in his house for a young lady who has been turned out of her home by an eccentric step-father lead to many uproarious situations. The principal fun-makers were Ralph Lovell as Clive Popkiss and Ken Mitchell as Gerald Popkiss, and they made the most of their opportunities. They were ably supported by Muriel Dru (as Gertrude Twine), Joan Townsend (Mrs. Leverett), Joe Allery (Harold Twine), Jean Linnell (Rhoda Marley), Donald Barrett (Putz), John Levers (Admiral Juddy), Violet Thornton (Poppy Dickey), Iris Cummins (Clara Popkiss), and Phyllis Hyde (Mrs. Possett).

The annual staff party of the **Truman Electrical Co.** was held on 19th April at the Masonic Hall, Walsall. Following dinner the toast of the company was proposed by Mr. A. T. Haywood (managing director of Electrical Components, Ltd.), and Mr. H. F. Truman replied. The evening's entertainment included dancing and a ventriloquial act.

OBITUARY

Mr. W. J. Bensley.—The death occurred on Saturday last at the age of sixty-two of Mr. W. J. Bensley, deputy managing director of the Sloan Electrical Co., Ltd., and president of the Electrical Wholesalers' Federation. He had been ill for some time and underwent an operation from which he did not recover. Mr. Bensley received his training at Siemens Dynamo Works and with the Brush Electrical Engineering Co. He joined the Sloan Electrical Co. in 1907 and was general sales manager for fifteen years before becoming deputy managing director. The funeral was to take place yesterday (Thursday) at St. George's Parish Church, Beckenham.

The late Mr. W. J. Bensley

Mr. F. W. Coomber, who has died at Worcester at the age of eighty-one, went to that city in 1894 and was concerned with the development by Mackenzie & Holland, Ltd., of the Sykes electrical lock and block railway signalling apparatus.

Mr. E. L. Barnes.—The death has occurred at St. Neots, Hunts, at the age of fifty-six, of Mr. Edward L. Barnes, A.M.I.Mech.E., who was formerly with the English Electric Co., Rugby, and then with Edmundsons Electricity Corporation, Ltd., at whose technical office in London he was concerned with the design and

layout of electric power stations. Among these stations was that at Little Barford, and on its completion he became mechanical superintendent and later deputy chief engineer. He held this post until he was forced to resign in March last because of ill-health.

WILLS

Sir Arthur H. Preece, LL.D., M.Inst.C.E., M.I.E.E., partner in Preece, Cardew and Rider, consulting engineers, who died on 31st January last, left £36,124 gross (£35,989 net).

Sir Allan Gordon-Smith, K.B.E., D.L., F.B.H.I., founder of S. Smith & Sons, and associated companies, who died on 12th February last, left £60,260 gross (£465 net).

Dr. E. Mallett, D.Sc., M.Inst.C.E., M.I.E.E., F.Inst.P., principal of Woolwich Polytechnic, formerly assistant professor at the City and Guilds (Engineering) College, and assistant engineer in the Post Office Engineering Department, who died on 10th December last, left £15,529 gross (£14,827 net).

Mr. A. R. Milne, B.Sc., A.M.I.E.E., Timperley, Cheshire, formerly head of the Electrical Department, National Boiler & General Insurance Co., Ltd., who died on 18th January last, left £1,188 gross (£1,112 net).

Mr. J. R. J. Bowden, A.C.G.I., A.M.Inst.C.E., A.M.I.E.E., a former deputy borough electrical engineer of Hackney, who died on 16th January last, left £3,401 gross (£3,352 net).

E.C.A. Conference

NEXT week (from 28th to 30th May) the Electrical Contractors' Association and its allied organizations—the National Federated Electrical Association and N.E.C.T.A., Ltd.—are holding their annual conference. This year, which marks the golden jubilee of the E.C.A., the conference is at Harrogate, the headquarters being at the Majestic Hotel. Mr. P. G. Wallis (G. E. Wallis & Sons (Electrical), Ltd.) is this year's president.

A meeting of the Council of the three Associations is to be held next Monday morning and during the day delegates will register at the Majestic Hotel. In the evening the president will hold a reception at the Majestic.

The conference opens next morning at the Royal Hall with the customary civic welcome by the Mayor of Harrogate, after which Mr. Wallis will deliver his presidential address. Subsequently Mr. E. R. Sanderson, A.M.Inst.C.E., A.M.I.E.E. (Chloride Batteries, Ltd.) will read a paper on "Storage Battery Emergency Lighting Systems." After the luncheon break two other papers are to be presented and discussed: one by Mr. W. T. Trace (vice-president) on "The National Apprenticeship Scheme" and the other by Mr. L. C. Penwill (director and secretary) on "Some Aspects of the Trading Structure of the Electrical Industry."

In the evening, at the Royal Hall, the Mayor is to hold a reception.

Wednesday's proceedings begin with the annual general meeting of the three Associations, when time will be provided for a general discussion of all matters of Association interest. The session will conclude with the installation of the new president, who will deliver a short address.

In the afternoon there is to be a garden party in the Valley Gardens, Harrogate, and the conference ends with a smoking concert and dance at the Royal Hall in the evening.

I.E.E. Garden Party

TO mark the occasion of the Joint Engineering Conference which is being held in London from 4th to 15th June by the Institutions of Civil, Mechanical and Electrical Engineers in connection with the Festival of Britain, the I.E.E. has arranged for an evening garden party (6.15 to 10.30 p.m.) to be held on 6th June at St. John's Lodge, Regents Park, possibly including a performance of "A Midsummer Night's Dream"; light refreshments will be served during the evening. This function will take the place of the I.E.E. Conversazione (last held in 1948) but a charge of 12s 6d will be made for each ticket.

Members registering for the Conference should apply for their garden party tickets on the detailed Conference reply form, which they should already have had. Members not registering should apply for tickets by completing the form which was issued with the April number of the *I.E.E. Journal*. If further application forms should be needed, they can be obtained from the secretary of the I.E.E.

B.B.C. Exhibition

YESTERDAY (Thursday) an exhibition organized by the B.B.C. was opened at 201–202, Piccadilly, London. The public will be admitted on weekdays from 11 a.m. to 10 p.m. until the Festival of Britain ends on 30th September.

A "live" television camera is being demonstrated which enables visitors to see themselves as they would be seen on television screens, while model sets and a working studio lighting model show how television producers cope with some of their problems. Recording engineers are also demonstrating some of the latest B.B.C.-designed gear. Visitors can record a few words and, by immediate play-back, hear their own voices.

OVERSEAS ELECTRICAL TRADE

Substantial Rise in April Total

THE figures relating to electrical export trade which we have extracted from the April "Accounts relating to Trade and Navigation" show a substantial increase as compared with those for April, 1950, and they are also well above the March, 1951, level. This may be partly but not wholly due to the fact that the Easter holiday period fell in April last year and in March this year.

It will be seen from Table I that the increase was general, with the notable exception of telegraph, telephone and signalling apparatus which declined in value from £1,411,283 to £1,151,572. The cable section, which showed a considerable shrinkage last month, made a satisfactory recovery; the total for all classes, including submarine telegraph and telephone cables, rose from £1,425,000 to

TABLE I.—ELECTRICAL EXPORTS

Class	April, 1951	April, 1950
	£	£
Telegraph and telephone cables and wires (submarine)	71,315	27,144
Ditto, not submarine	700,955	592,553
Wires and cables, paper insulated	658,625	430,111
Ditto, rubber insulated	198,173	202,180
Ditto, cotton, silk or artificial silk insulated	18,555	47,191
Ditto, enamel, glass or asbestos insulated	83,057	40,302
Ditto, other	242,397	85,742
Commercial radio apparatus	139,030	285,623
Domestic radio apparatus	129,552	180,407
Telegraph, telephone and signalling apparatus	1,151,572	1,411,283
Radio loudspeakers	65,058	38,916
Telecommunication components, n.e.s.	414,365	250,475
Other telecommunication apparatus	104,651	61,401
Valves and cathode ray tubes	332,529	175,938
Carbons	29,906	16,226
Lamps, exceeding 24 V	113,521	57,907
Ditto, not exceeding 24 V	25,315	22,665
Other lighting appliances	401,674	284,115
Primary batteries	185,709	80,007
Parts other than carbons	28,402	18,561
Accumulators for motor vehicles	240,904	147,168
Ditto traction	15,324	20,125
Ditto radio	5,109	1,817
Other portable accumulators	96,533	78,251
All other accumulators	89,901	52,824
Parts and accessories	74,754	62,644
Cooking appliances	178,540	108,457
Heating appliances	72,641	37,301
Parts and accessories for cooking and heating appliances	66,067	30,496
Flat irons	83,233	38,961
Commercial electrical instruments	121,007	101,792
House service meters	141,128	55,579
Time recorders and time switches	25,247	17,479
Other electrical instruments	115,183	96,888
Electro-medical apparatus (not X-ray)	56,619	34,297
X-ray apparatus, tubes and parts	164,206	62,317
Permanent magnets	29,087	17,869
Insulating cloth and tape	105,015	73,798
Other insulating materials	105,453	73,887
Unclassified electrical goods and apparatus	534,945	344,265
TOTAL electrical goods and apparatus	8,326,709	5,793,072
Diesel driven generators not exceeding 200 kW*	350,555	456,708
Ditto, exceeding 200 kW*	151,088	101,362
Other generating sets*	241,282	195,809
Generators exported without prime movers, and parts of generators†	385,368	139,885
Motors, railway, tramway and trolley bus	10,901	—
Ditto, other, not over ¼ h.p.	164,305	61,667
Ditto, over ¼ h.p. but under 1 h.p.	74,876	33,530
Ditto, from 1 h.p. to 250 h.p.	489,336	400,891
Ditto, exceeding 250 h.p.	72,213	48,991
Ditto, parts	107,134	77,251
Converting machinery	13,289	12,239
Transformers, including coils	799,237	416,625
Rectifiers for power house use	62,693	26,134
Motor starting and controlling gear	199,481	154,277
Switchgear and switchboards (not telegraph and telephone)	1,091,386	818,059
TOTAL electrical machinery	4,213,144	2,943,518
Washing machines (not exceeding 250 lb weight)	567,555	225,494
Ditto, parts	14,940	26,383
Vacuum cleaners	225,889	159,953
Ditto, parts	47,266	26,642
Other electrically operated portable appliances and parts	186,182	75,426
Portable electric tools	132,136	64,285
Unspecified electrical machines, machinery and parts	305,976	19,628
GRAND TOTAL	14,019,797	9,334,401

* The 1950 figures include generators without prime movers

† The 1950 figures are for parts of generators only

£2,303,000. South Africa and New Zealand took much larger quantities of power cable of all classes.

Both commercial and domestic radio equipment exports made noteworthy advances, the former from £285,623 to £439,030 and the latter from £180,407 to £429,552; in both cases South Africa increased her purchases. There was a jump from £48,476 to £82,310 in Sweden's share of commercial radio exports. The fall in shipments of telegraph and telephone equipment was largely due to a fall in Australia's total from £470,462 to £230,867.

The remarkable increase in exports of cooking and heating apparatus was spread over the leading buyers, notably Australia (£68,710), South Africa (£51,533) and the Irish Republic (£38,438). South Africa, India and Sweden were leading importers of British electrical instruments and all increased their purchases.

Of the total value of electrical goods and apparatus exported South Africa headed the list with £894,072—over double the April, 1950, figure. Australia came second but actually with a reduced amount. Sizeable rises were recorded for New Zealand and the Irish Republic. China's share increased from £374 to £44,502 but that of Russia fell from £24,794 to £5,820.

In the shipments of generators, too, the Russian figure declined considerably—from £242,859 to £114,077, in contrast to an advance from £15,318 to £162,544 in the case of South Africa. That country was also the largest buyer of electric motors, taking machines worth £167,561. Australia also proved to be a bigger buyer.

Electric washing machine exports made a substantial advance—from £225,494 to £567,555—and vacuum cleaner exports also continued to move upward.

Electrical imports during April were:—Goods and apparatus £480,712 (against £363,381); machinery £81,256 (against £78,946). The largest items were electronic valves and radio equipment and the Netherlands was the largest supplier.

TABLE II.—Distribution of Electrical Goods and Apparatus

Destination	April, 1951	April, 1950
	£	£
Channel Islands	27,057	23,865
Gibraltar	6,112	2,596
Malta and Gozo	78,846	8,561
Cyprus	30,661	13,045
British West Africa	128,541	72,633
Union of South Africa	894,072	452,370
Northern Rhodesia	20,468	18,857
Southern Rhodesia	139,676	123,998
British East Africa	219,795	132,271
Bahrein, Kuwait, Qatar and Trucial Oman	38,390	41,565
India	589,453	481,056
Pakistan	153,051	80,446
Malaya	304,726	250,155
Ceylon	151,122	60,967
Hong Kong	215,675	78,360
Australia	799,387	1,002,732
New Zealand	514,551	282,816
Canada	181,339	122,089
British West Indies	135,016	48,955
Anglo-Egyptian Sudan	14,177	29,882
Other Commonwealth Countries	83,955	40,322
Irish Republic	436,898	291,167
Soviet Union	5,820	24,794
Finland	25,386	24,273
Sweden	291,238	162,442
Norway	180,951	79,650
Iceland	29,810	3,676
Denmark	176,632	81,282
Poland	24,163	41,642
Germany	54,980	6,468
Netherlands	234,760	136,525
Belgium	137,840	82,411
France	67,537	108,007
Switzerland	35,527	20,934
Portugal	127,156	27,964
Spain	47,909	21,050
Italy	57,709	25,031
Austria	12,480	22,625
Hungary	5,353	23,210
Czechoslovakia	11,994	11,296
Greece	64,134	63,206
Turkey	55,260	35,422
Indonesia	23,022	11,177
Portuguese East Africa	17,848	12,621
Syria	8,201	16,155
Lebanon	5,705	47,518
Israel	18,624	28,095
Egypt	216,504	201,884
Arabia	16,717	7,122
Iraq	16,071	96,250
Iran	37,377	91,601
Burma	58,637	28,650
Thailand	51,486	21,735
China	44,502	374
United States of America	157,827	30,949
Colombia	22,834	12,508
Venezuela	82,330	38,167
Peru	88,513	10,456
Chile	56,989	18,255
Brazil	198,065	154,477
Uruguay	43,152	19,962
Argentine Republic	174,816	202,526
Other Foreign Countries	177,849	78,914
Total	8,326,709	5,793,072

NEXT WEEK'S EVENTS

Monday, 28th May, to Wednesday, 30th May

HARROGATE.—Electrical Contractors' Association. Annual Conference.

LONDON.—Savoy Place, W.C.2. I.E.E. Measurements Section. Conference on "Electrical Instrument Design."

Wednesday, 30th May

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. Scottish Centre. Annual general meeting.

Thursday, 31st May

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. Association of Mining Electrical and Mechanical Engineers (South Wales Branch). Annual general meeting.

The Telecinema

Stereoscopic Pictures and Stereophonic Sound

Cinema television projector box viewed from the theatre

FROM the very start the Telecinema at the South Bank Exhibition was designed to incorporate all that is new in both film and television techniques. It is the first theatre in the world in which large-screen television and three-dimensional pictures with stereophonic sound take their place on an equal footing with established sound film as it has been known for twenty-five years.

The building is constructed with seating at two levels, the stalls with 252 seats being reached from the ground floor by a short descending flight of stairs, while the balcony with 150 seats is two flights up. The access block containing the stairways is structurally isolated from the cinema itself and as it is placed at the railway bridge end of the building it serves to isolate the auditorium to some extent from airborne sound and vibration. The projection room is placed between balcony and stalls, giving the cinema a "lobster-claw" design when seen in section.

Inside the auditorium the eye is caught at once by the screen surround; the orthodox proscenium design inherited from the stage has been abandoned and in its place is a perforated frame, not unlike a picture frame, which is splayed outwards from the screen and forms the sole link between the screen and the walls and ceiling. The floor has a concave curve, the rear seats sloping down towards the screen, while the front ones slope upwards. This gives a more comfortable view of the screen to those seated in the front stalls.

For film projection the equipment consists basically of two standard B.T.H. S/U/P/A projectors, which are already installed in many cinemas in this country and overseas. Their design is such that the special apparatus required for this new form of motion picture presentation can be incorporated in standard machines without any major alterations to existing equipment.

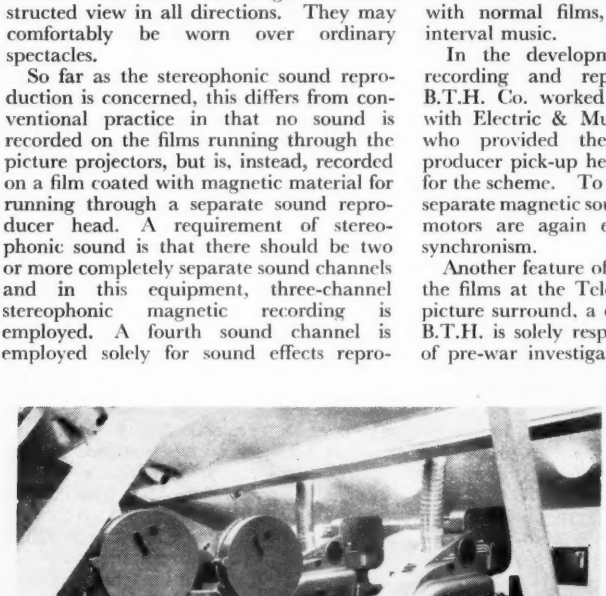
Present techniques have not yet reached the stage where it is possible to present stereoscopic pictures to large audiences without making a compromise between the ideal and what is possible; this compromise involves the wearing of some form of spectacles by the audience. Two methods of stereoscopic viewing are possible by means of spectacles, the first using two-colour spectacles and the second perpendicularly polarized ones. As two-colour spectacles preclude the use of colour films, the

polarized-lens system has been adopted. Two images maintained in horizontal and vertical register are projected on to the screen by running two separate 35mm film projectors in synchronism with one another, the light beam from each being polarized by filters carried on the projectors. The resulting images on the screen, when viewed through polarizing spectacles, give a remarkably effective three-dimensional picture. The two projectors running side-by-side are synchronized by the use of Selsyn motors. The polarizing equipment has been supplied by Polarizers (U.K.), Ltd., and the spectacles provided resemble beach glasses and have large areas of "Polaroid" so as to give an unobstructed view in all directions. They may comfortably be worn over ordinary spectacles.

So far as the stereophonic sound reproduction is concerned, this differs from conventional practice in that no sound is recorded on the films running through the picture projectors, but is, instead, recorded on a film coated with magnetic material for running through a separate sound reproducer head. A requirement of stereophonic sound is that there should be two or more completely separate sound channels and in this equipment, three-channel stereophonic magnetic recording is employed. A fourth sound channel is employed solely for sound effects reproduced from speakers mounted in the main and balcony ceilings, and at the back of the auditorium. The sound from the three stereophonic tracks is reproduced from behind the screen, where three speaker systems for this reproduction each consist of a standard B.T.H. S/U/P/A combination of twin-unit low-frequency horns and twin-unit high-frequency horns, with a changeover frequency of 500 c/s. Each of the three stereophonic sound channels feeds one speaker combination and the sound from the screen accompanies its apparent source on the screen. The screen speakers are used not only for the reproduction of stereophonic sound but also for monaural sound in conjunction with normal films, television sound and interval music.

In the development of the magnetic recording and reproducing system the B.T.H. Co. worked in close collaboration with Electric & Musical Industries, Ltd., who provided the magnetic film, reproducer pick-up heads and pre-amplifiers for the scheme. To run the projectors with separate magnetic sound reproducers, Selsyn motors are again employed to maintain synchronism.

Another feature of the presentation of all the films at the Telecinema is a projected picture surround, a development for which B.T.H. is solely responsible. It is a result of pre-war investigations by the company into the possibility of providing an alternative to the black border around the picture, which, it is felt, detracts from the appearance of the picture, but which is still the present standard practice of the cinema industry. For optimum presentation of picture detail and colour, the picture should



Projection room at the Telecinema showing the two specially adapted B.T.H. film projectors. In the foreground is the B.T.H. recorder/reproducer with E.M.I. replay amplifier cubicles and magnetic heads for the stereophonic system

be presented against a neutral background such that the highlights on the screen are always brighter than the surroundings, and the dark portions of the picture always darker than the surroundings. These conditions can be satisfied by projecting the surround lighting from the film projector itself in such a manner that the intensity and colour of the surround takes on the average intensity and colour of the picture at all times.

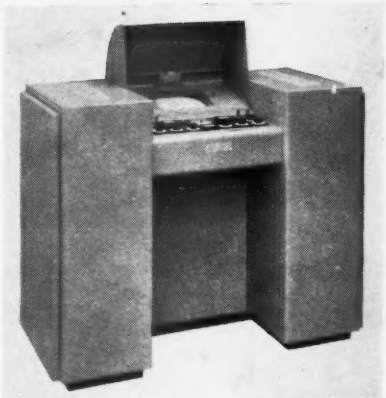
This feature is achieved, fairly simply, by making use of the light normally wasted during the pull-down period when the shutter is closed. A standard shutter having a reflecting rear surface is employed to reflect the normally-wasted light on to a mirror and then through a special optical system on to the screen. This optical system contains masks to shape the light beam so that it only illuminates the surround. The scheme is completely independent of any manual control and results in a perfect background for film projection.

Projected Television

Since large-screen television opens the programme at the Telecinema and forms one of the most striking elements in it, a great deal of thought has been put into giving it entertainment value. While arrangements are provided for feeding in B.B.C. programmes, most of the material televised originates in the Telecinema itself. Provision is therefore made for the main foyer and the projection room to act as a studio where interesting visitors are brought to the camera and microphone.

The camera, a product of Marconi's Wireless Telegraph Co., is the latest Mark II model, incorporating an " Image Orthicon " pick-up tube. A four-lens turret operated from the back of the camera enables rapid changes of focal length to be made, and an electronic viewfinder ensures that the camera man sees exactly the same picture as the pick-up tube transmits, there being no parallax errors.

The television projector, which forms a full-screen 15ft image with its own projected light surround, is set forward from the projection booth on an open platform. When wheeled to one side during film projection, it can be serviced without disturbance to the other equipment. It has been designed and built by Cinema-Television, Ltd., and employs a 50 kV cathode-ray tube to project an image through a Schmidt-type optical system on to the Stableford high-gain screen. The equipment is designed to produce pictures up to 21ft wide and although it normally employs the 405-line scan standardized by the B.B.C., it is adaptable to other transmission standards.



Large screen television control console

Gauge and Tool Exhibition

THE third Gauge and Tool Exhibition to be organized by the Gauge and Tool Makers' Association was opened at the New Hall of the Royal Horticultural Society in London last week by Mr. W. R. Herod, president of the International General Electric Co., of America and Co-ordinator of North Atlantic Defence Production.

The types of products being displayed at the exhibition are broadly gauges and measuring instruments and equipment ; jigs, fixtures and special tools ; press tools ; special purpose machinery ; engineers' small tools ; moulds and dies; portable power tools and diamond tools.

As would be expected in an exhibition of this kind there is very little electrical equipment on view although a wide range of the exhibits are of interest to electrical manufacturing concerns : plastics moulding presses and associated apparatus for instance. One item which will interest all users of presses and automatic machines is the hydraulically operated " Productafeed " unit of the Birmingham Gauge & Tool Co., Ltd., which has been designed with the object of superseding existing slide and roll feeds. It has the advantage of rapid loading and instantaneous pitch selections.

Among the few electrical items on view are the M.P.J. film thickness meter and " Sigma " electronic multi-dimensional inspection equipment. The exhibition closes to-day, Friday.

"The Chesters"

Dedication of I.E.E. Residential Estate

FAIR weather favoured the formal "opening" on 18th May of the estate at New Malden, Surrey, which the Institution of Electrical Engineers is building for the rehabilitation of members, or their dependants, who have fallen upon hard times.

The Rev. C. L. Cresswell, chaplain of the King's Chapel of the Savoy, conducted a simple service of dedication during which Mrs. H. M. Hughes, daughter of Mr. C. W. Speirs, unveiled a memorial tablet in the gardens.

Sir Archibald J. Gill, president I.E.E., in a short address, explained the inception of the scheme in 1944 in commemoration of the supreme sacrifice of those members of the Institution who lost their lives in the 1939–45 war. The necessary capital is being provided by the Homes Fund, to which members will continue to subscribe, in addition to the Incorporated Benevolent Fund of the Institution.

Mr. C. W. Speirs, who has been a member of the Institution since 1897, most generously gave some six acres of his own delightfully situated estate on high ground that gently slopes towards the south, affording uninterrupted views of the Surrey Hills. Messrs. Louis de Soissons, Kenneth Peacock and D. Hodges have been responsible for the architectural work and Mr. H. Nunn is the warden of the estate.

The first eight of the intended twenty-six homes were completed in August, 1950; they are now all happily occupied. Much care has been exercised in the endowment of each house with an identity of its own.

The endeavour has been to re-create something like the atmosphere of a small village community by arranging the houses, each with its own small garden behind, around broad lawns as the accompanying photographs show.

The approach is along a broad avenue of mature lime trees and variation of the general design, which has regard for the needs of older folk and young children, is introduced by choice of style and type. There are three-bedroomed detached houses as well as two-bedroomed detached and semi-detached; also a composite unit of two flats and one house, so that different requirements of the occupants can be satisfied.

Further variety results from the internal planning; there is a kitchen/dining-room arrangement as well as the dining-room/hall, or living room with dining recess. An open fireplace is in the living room and in one bedroom, but electricity is used for room heating, cooking and water heating. Under the draining board of the sink, beside the water heater, is space for a wash-boiler or small clothes washer. Built into the kitchen cupboard area is a small electric refrigerator; a lamp inside the larder is controlled by a door switch. Three-tier service hatches for tradesmen's deliveries are accessible from the covered-way side entry to each house.

Rent will not be payable by the tenants, who may receive additional benefits besides, since the idea is to help them back to their accustomed peaceful environment quite free of any patronage or suggestion of institutional habitation.

The first stage in the development of the second and larger (four-acre) portion of the estate is about to begin.

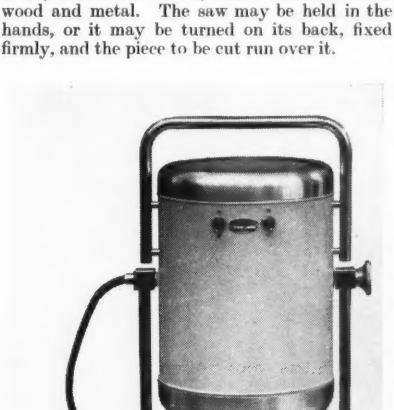
The Paris Fair

From Our Paris Correspondent

THIS year's Paris Fair fell earlier than usual (the date is decided according to the way Easter falls), and for that reason business was less brisk than usual. The electrical section was not well placed, having been pushed out of the central position which it usually occupies into a far-off wing of the Fair. One reason for this may have been that the section has few novelties to offer. Almost everything has been said on domestic electricity. It was even difficult to find interesting modifications in the design of appliances exhibited.

Thermor of Orleans showed a 10 litre cylindrical water heater placed over the kitchen sink. This heater has fairly low loading—500 W—and is automatically controlled. The same concern showed a mixed clothes washing machine. It is heated by gas and has a 300 W motor. Apart from that the washer had no particular novelty.

A small electric hand saw by Scintilla (Switzerland) was one of the most interesting exhibits. This saw weighs only about 6 lb. It has a 110 to 250 V universal 200 W motor. There is a variety of models. Some are designed for wood, others for metal, and others for both wood and metal. The saw may be held in the hands, or it may be turned on its back, fixed firmly, and the piece to be cut run over it.



The Electro-Thermique "air conditioner"

Electricité de France had a joint stand with Gaz de France and showed a good variety of domestic apparatus. Nothing in this display, however, was sufficiently novel to merit particular mention.

The Sté Général de Constructions Electro-Thermiques offered what it called a "floating air conditioning apparatus" or *radiateur soufflant* (illustrated). This equipment is mounted on trunnions and can, therefore, be turned in any direction. It cools the air in summer and heats it in winter. The makers also claim that it may be used as a hair dryer. The apparatus weighs approximately 16 lb, has a 2,200 W silent motor and an output of 350 cu m of air per hour.

The Sté Générale d'Appareillage of Lyons also had on view a ventilation radiator. This comprises a series of heating elements placed round a fan. The 3 kW motor has two speeds, 1,500 r.p.m. and 3,000 r.p.m.

M.K.S. Units

The I.E.C. Decisions in Paris

THE official minutes of the Paris meeting last July of Technical Committee No. 24, concerned with electrical and magnetic units, of the International Electrotechnical Commission having now reached the B.S.I. (the British National Committee of the I.E.C.) it is possible to indicate the decisions come to regarding the M.K.S. system of units:—

1.—The Committee, in the light of the National Committees' replies to an inquiry made by the I.E.C. central office, recorded that "Newton" was finally adopted as the name of the unit of force in the M.K.S. system.

2.—The Committee considered it convenient to base the M.K.S. system for electrical quantities on four principal units and recommended, for the purpose of developing the definitions of the units, that the fourth principal unit should preferably be the ampere.

3.—Rationalization was adopted for the M.K.S. system, consequently resulting in the adoption of the following formulæ:—

$\mu_0 = 4\pi\ 10^{-7}$ for the permeability of free space (henry/metre). $\epsilon_0 = \frac{1}{\mu_0 c^2}$ for the permittivity of free space (farad/metre), c being the velocity of light in free space. The I.E.C. symbol for permittivity is ϵ.

Torquay Tariff Agreements

No Substantial Concessions

By JOHN C. HANCOCK

UNDER the tariff agreements negotiated at Torquay from 28th September, 1950, to 21st April last the United Kingdom is to make some small reductions in the rates of duty on, among other things, electric motor and generator casings and unwound rotors and stators, carbon brushes and carbon electrodes, and porcelain insulators exceeding 2 lb in weight. In addition an undertaking has been given to " bind " certain duties at their present levels, the goods affected being X-ray apparatus, electric switches, plugs and sockets, watt-hour meters, thermostats, radio valves and vacuum tubes. These reductions and bindings made by the United Kingdom are set out in the appended table. Concessions made by the participating countries are due to come into effect on 1st September next and are planned to last at least until 1st January, 1954.

Bilateral Negotiations

The procedure adopted in these negotiations is for countries who are major buyers and sellers of specified products to engage in two-way discussions with a view to reducing or binding duties at their present levels on commodities in which they are particularly interested. Thus, if country " A " agrees to reduce a rate of duty on a given item from 20 per cent to 10 per cent at the request of country " B " then all participating countries share in the reduction under the most-favoured-nation clause of the General Agreement.

The Torquay Schedules of Tariff Concessions, made public last Whit Monday, run into some 700 closely printed pages. Unfortunately the schedules show only the rates of duties agreed upon at Torquay and do not show the old rates alongside for comparison. Therefore to arrive at any comparison between the old rates and the proposed new rates reference must be made to the customs tariffs of the countries concerned.

Altogether 147 bilateral agreements were concluded which are incorporated in 32 schedules—one for each participating country or customs union—annexed to the Torquay Protocol to the General Agreement on Tariffs and Trade. Each schedule summarizes the concessions made by each contracting party without disclosing at whose request the concessions were made. As soon as the separate schedules have been analysed items of direct interest to the electrical industry will be published in the *Electrical Review*.

U.K. Agreements

The United Kingdom concluded nine separate agreements. These were with Denmark, France, Norway, Sweden, Austria, Western Germany, Peru, the Philippines and Turkey, the last five countries being newcomers to the Agreement. While the White Paper (Cmd. 8228)* states that negotiations were also undertaken between the United Kingdom and the United States " but did not result in agreement," United Kingdom electrical exporters may derive some advantage from concessions given by the United States at the request of some other government or governments.

Many most-favoured-nation rates of duty in the American tariff standing at 15 per cent are to be reduced to 12½ per cent. Among the items affected are electric motors and transformers, radio and television apparatus, electric welding apparatus and electric furnaces, and parts of the foregoing. The duty on X-ray apparatus (other than tubes) is to be reduced from 10 per cent to 8¾ per cent and the duty on " electrical wiring apparatus and devices " is to be reduced from 22½ per cent to 17½ per cent. To learn that the duty on electric flat irons " plated with silver on nickel-silver or copper " has been bound at 25 per cent means next to nothing in terms of everyday trade and is on a par with the 5 per cent

* " Report on the Torquay Tariff Negotiations " (H.M. Stationery Office, 9d)

reduction conceded by the United Kingdom on boiled salted beef udders.

The abandonment, by Canada, of the system of Imperial Preference, and her far-reaching agreement with the United States, which have been given much publicity in the Press, do not intimately affect electrical exporters in the United Kingdom. That several concessions have been made in favour of the United States cannot be denied, but these appear to relate in the main to foodstuffs and textiles. Electrically speaking, the most important alteration seems to be a reduction in the m.f.n. rate of duty on electric refrigerators from 22½ per cent to 20 per cent, leaving a margin of preference in favour of the United Kingdom of a mere 2½ per cent. (The British preferential rate is 17½ per cent.)

As long ago as 1947 Canada stated at Geneva that she would consider herself freed from the Ottawa Agreements of 1932 and would, if necessary, reduce the margins of preference without the consent of the United Kingdom. The present large-scale agreement between Canada and the United States represents, no doubt, a further step in the move towards closer integration with the American economy.

Allowing for the fact that considerable concessions had already been made by the original contracting parties at Geneva in 1947 and at Annecy in 1949 the main impression gained from a review of the seven months' discussion at Torquay is one of slight disappointment. To sum up: fully two-thirds of the so-called concessions appear to consist of " bindings " while the remainder represent some small reductions which may, or may not, be of use to exporters. If the concessions made by other governments are reflected in the concessions made by the United Kingdom this impression will be confirmed upon closer examination.

U.K. TARIFF CONCESSIONS MADE AT TORQUAY

Description of Products	Proposed New Rate of Duty	Present Rate
Electric motor and generator casings and unwound rotors and stators	10%	15%
Permanent magnets	20%	33⅓%
Perforated separators not being parts of motor vehicle accumulators	15%	B*
Ignition magnetos and dynamo-magnetos	25%	32½%
Parts and accessories of cycles (other than motor-cycles), the following :—		
(i) Electric dynamo lighting sets, comprising dynamo and headlamp, with or without clips and wiring, and with or without rear lamp.	2s 6d per set or 30%, whichever is the greater.	2s 6d per set or 33⅓%
(ii) Dynamos for lighting sets, with or without clips and wiring ; and cases (or bodies) thereof, whether complete or not.	2s each or 30%, whichever is the greater.	2s each or 33⅓%
(iii) Electric lamps adapted for use on cycles ; and cases (or bodies) thereof, whether complete or not.	6d each or 30%, whichever is the greater.	6d each or 33⅓%
Electric lighting switches, plugs and sockets	20%	B*
Thermostats, other than laboratory thermostats	20%	B*
Discharge lamps and tubes	33⅓%	B*
Thermionic or electronic tubes and valves ; cathode-ray tubes	33⅓%	B*
X-ray tubes	33⅓%	B*
X-ray apparatus, medical, the following :— Bucky diaphragms. Bucky tables. Dosage recorders. Film cassettes. Cassette holders. Generators. Intensifying screens. Shields for X-ray tubes. Stands for mounting X-ray equipment.		
X-ray units.	33⅓%	B*
Arc lamp carbons (other than carbons externally covered with copper and of a diameter not exceeding 14 mm)	2s 6d per lb	5s per lb
Amorphous carbon electrodes, but not including primary battery carbons or arc lamp carbons	25%	33⅓%
Carbon brushes fitted with metal terminals or metal connectors	15%	20%
Porcelain insulators of a weight exceeding 2 lb	15%	20%

B* indicates that the existing rate has been bound at the figure shown in the preceding column.

Decentralization Problems

IN our issue of 9th March we reviewed a paper read by Sir Henry Self (deputy chairman (administration), British Electricity Authority) before the British Institute of Management on " Problems of Decentralization in a Large-Scale Undertaking—the Organization of the Central Authority and Area Boards of the Electricity Supply Industry." This paper has now been published in booklet form and is obtainable from the Institute at 8, Hill Street, London, W.1, price 2s 6d.

Commerce and Industry

Ducts for Services

Award on Holidays Claim

THE Council for Codes of Practice for Buildings has recently issued in final form CP413 (1951) "Design and Construction of Ducts for Services." This Code was originally issued as a draft for comment, under the title of "Design and Construction of Pipe Ducts," but it was decided to enlarge the scope to include ducts for all services besides pipes. It was revised before publication by a committee convened by the Institution of Mechanical Engineers on behalf of the Council.

The Code deals with the design and construction of all forms of ducts for the accommodation of pipes, cables, etc., within and adjacent to buildings. The importance of early and thorough co-operation between the various parties concerned is stressed. Notes are included on the preparation of a time schedule and a list gives the British Standards for materials required in the construction of ducts.

The types and arrangement of ducts, chases, trenches and subways to suit various requirements are described in considerable detail and typical examples illustrated. Guidance is given on construction methods and materials, together with details regarding the access arrangements, suppression of noise, avoidance of transmission of heat, and, in particular, precautions against fire risk. The Code concludes with recommendations on inspection and general maintenance.

Copies may be obtained from the British Standards Institution, 24/28, Victoria Street, London, S.W.1, price 3s post free, reference CP413 (1951).

Contract Price Adjustment Formulæ

The following are the latest figures for use in the B.E.A.M.A. contract price adjustment formulæ :—Rates of pay.—The rate of pay for adult male labour at 12th May is deemed to be 120s. Cost of material.—The Board of Trade index figure for intermediate products published on 12th May is 386·1 and is the figure for April.

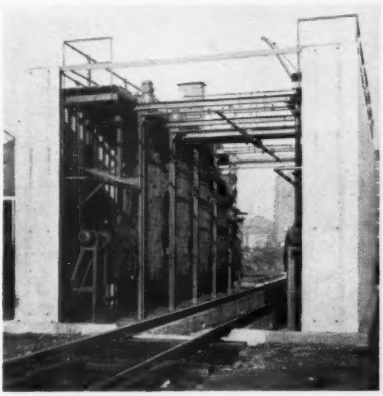
Scientific Film Congress

The International Scientific Film Association is holding this year's congress in the Municipal Museum at the Hague, Holland, from 15th to 22nd September. During this period there will be meetings of the General Assembly of the Association and of the Permanent Committees dealing with medical, research, technical and industrial films, as well as a Festival of Scientific Films. A special committee of the British Scientific Film Association will be set up to recommend films for submission to this Festival and will be glad to receive information as soon as possible about suitable films. In addition, the Association (4, Great Russell Street, London, W.C.1) would like to have details of research and record films of specialized types for showing at meetings of the Permanent Committees.

Train Washing Plant

New train washing plant installed at the London Transport Hammersmith depot incorporates several developments in design, including an open form of construction. Eight vertical and four horizontal cleaning spindles are provided ; each is driven by an independent weatherproof squirrel-cage motor combined with an enclosed reduction gear, the whole being mounted co-axially above the vertical spindle or at the end of the horizontal spindle. The motors driving the group of spindles which comprise each half of the machine are controlled by a separate weatherproof starter mounted above the machine, so that each half of the machine can be operated independently. Each group of four vertical motors and each pair of horizontal motors is controlled by separate push-buttons and, to reduce the current demand at starting, time-relays are provided which

Improved train washing plant at the London Transport Hammersmith Depot



cause the motors in each group to start successively. Provision is made for the independent isolation of motors if required.

In order to eliminate foot valves and the need for priming, the motor driven pumps are of the vertical spindle type with "drowned" suction. They are mounted in a dry-well adjoining the settling tank, in such positions that the pump casings are full when the water is at the normal standing level.

Although the main bulk of the washing water is re-circulated, a final rinse is provided by clean water sprays as the train emerges from the machine. Hand removal of sludge from the settling tanks has been eliminated by a system whereby the sludge can be thoroughly mixed with the water in the scavenging chamber and drained.

The plant was constructed by the staff of the London Transport Executive to designs prepared under the direction of Mr. W. S. Graff-Baker, chief mechanical engineer (railways).

Tramcar Equipment for Finland

An order has been placed with the Metropolitan-Vickers Electrical Co., Ltd., for 15 sets of electromagnetic remote control gear and 30 motor-generator sets for incorporation in new tramcars being built for the Helsinki Tramway Co., Finland.

Electronics Exhibition

The sixth annual Electronics Exhibition, organized by the North-Western Branch of the Institution of Electronics, will be held at the College of Technology, Manchester, on 24th, 25th and 26th July.

An extensive programme is planned including, in addition to the products of the usual exhibitors, a non-commercial section composed of exhibits from the universities and from scientific associations. There will be an exhibition of modern scientific films; demonstrations of the Compton electronic organ, of the Ferranti logical computor, and of television reception on home constructed receivers. An amateur short-wave radio transmitter/receiver will operate throughout the period of the Exhibition. Admission will be by tickets obtainable from Mr. W. Birtwistle, hon. secretary, N.W. Branch, Institution of Electronics, 17, Blackwater Street, Rochdale, Lancs.

Miners' Pensions

The fifth of its studies of nationalized industry produced by the Acton Society Trust, Acton House, Church Road, Claygate, Surrey, deals with miners' pensions. It is of interest to the electrical industry in so far as the institution of supplementary pensions in the coal industry is likely to be regarded as a precedent by employees in other nationalized services.

Indian Communications Plan

An advisory committee to the Indian Ministry of Communications has approved a scheme for the development of India's external communications costing £750,000 spread over five years. It provides for the erection of a new radio station in Calcutta and the improvement of the Delhi, Bombay and Madras stations.

Wireless and Electrical Trader Year Book

In the 1951 edition of "The Wireless and Electrical Trader Year Book: Radio, Television and Electrical Appliances" considerable space has been devoted to television data designed to meet the needs of dealers in the areas in which the new television stations are to be opened later this year. This includes condensed specifications of current commercial television receivers (with such valuable facts as valves used, I.F. values, etc.) and information on valve and cathode-ray tube base connections, with over 200 valve base diagrams.

Other data include specifications of current radio receivers, legal information and a directory of trade associations. There is also a new section on TV test equipment and notes on licensing requirements as they affect the retailer. The directory sections have been brought up to date.

Copies of the Year

Festival of Britain window display at the Easy Row, Birmingham, showroom of the Simplex Electric Co., Ltd.

Book, the price of which is 2s 6d post free (with a reduction to subscribers to *Wireless & Electrical Trader*), can be obtained from the Trader Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1.

Pig Rearing

Mortality of piglets in farrowings occurring in cold weather has been practically eliminated at Mr. A. H. Fuller's Henley Farm, Great Shefford, near Newbury, by the widespread use of farrowing pen heaters. This makes it possible to secure two successful farrowings a year and also to spread them throughout the year.

Mr. Fuller is in the course of building up his herd of breeding sows to about 150 to produce 2,000 bacon pigs a year and 46 1 kW G.E.C. reflector type heaters are being installed. Twenty-two have been in operation since the beginning of the year; the remainder will go into a new building in course of construction. Various other electrical aids to production are being adopted including two mills for preparing feeding stuffs (a 20 h.p. "Hammamac" mill and a 3 h.p. "Essex" mill), a Graiseley electric truck for carrying round the food to the various sties, and a sewage pump. The installation is being carried out by the Hungerford Branch, Newbury Sub-Area, Southern Electricity Board.

Pig farrowing heater in use at Henley Farm, Great Shefford

Changes of Name

The **Barton Electrical Co., Ltd.**, has changed its name to Barton Electric, Ltd.

A.B.E. Properties, Ltd., has been renamed Brush Aboe Properties, Ltd. At 24th November, 1950, the Brush Electrical Engineering Co., Ltd., held practically all the issued shares.

Electric Heating in Ships

E. K. Cole, Ltd., announce that they are installing "Thermovent" marine heaters in the Post Office Cable Ships *Iris* and *Ariel* which are being converted from steam to electric heating.

Trade Announcements

The **City & Continental Trading Co.** announces that it has transferred its interest in the distribution of all electrical equipment in London and the Home Counties to the **Batt Electrical Co.**, 28a, Dock Street, E.1.

Smith's Electric Vehicles, Ltd., have appointed the following new distributors :—Bristol and the West Country (including Somerset and parts of Wiltshire and Gloucestershire)—West of England Electrics (Bristol), Ltd., 35 & 37, Stokes Croft, Bristol, 1. South Yorkshire, North Derbyshire and parts of Nottinghamshire—Southgrove Engineering Co., Ltd., Siddall Street, Sheffield, 1.

E.T.U. Holiday Claim

At a sitting held on 1st May the National Arbitration Tribunal heard a claim on behalf of members of the Electrical Trades Union employed by members of the National Federated Electrical Association for two weeks' paid holiday per annum. The present arrangement allows six days' holiday, payment for which is provided by a credit of 2s 6d for each week of employment during an account year for journeymen electricians and 2s for mates.

The Union contended that the principle of two weeks' annual holiday was now generally accepted. Against this the N.F.E.A. said that the granting of one week's paid holiday was common practice in the engineering and building industries and only a third of manual employees in industry enjoyed two weeks' holiday. It was maintained that to accede to the request would further increase the cost of electrical contracting work and industrial costs generally.

The Tribunal in its Award No. 1661 (H.M. Stationery Office, 2d) finds that the claim has not at present been established and awards accordingly.

Gas Turbines at the Festival

In connection with the Festival of Britain a "Gas Turbine Week," organized by Power Jets (Research & Development), Ltd., at the request of the Festival authorities and with the help of many industrial concerns, is to be held in London from 18th to 23rd June. During the week the world's first jet flying boat, the Saunders-Roe A1, will land on the lower reaches of the Thames and will be towed to a

mooring near the South Bank Exhibition site where it will be on view to the public. The Naval M.T.B. 5559, fitted with a Metropolitan-Vickers gas turbine engine, will also be seen in action near the South Bank. In the Exhibition itself, prominence will be given to gas turbine items and at the Telecinema a documentary film entitled "Wonder Jet" will be shown which tells the story of Sir Frank Whittle's development of jet engines. A gas turbine information bureau will be set up near the Transport Pavilion.

A.S.E.E. Conference

Speaking at the annual conference at Nottingham of the Association of Supervising Electrical Engineers last Saturday Mr. F. W. Smith, chairman of the Association, said that so great was the demand for skilled and unskilled labour that there was practically no unemployment, wages were higher than ever before in the history of the country, order books were full and the standard of workmanship was being maintained. The position, however, was an artificial one, and we would have to face difficulties and problems greater than any we had had previously.

Rising costs of living naturally demanded higher wages, and there was a school of thought which suggested that a strike or threat of a strike was the only way of rectifying the balance. Strikes should not be necessary, particularly in these days of an abundance of negotiating machinery. The object could be achieved if settlements were reached without such long delays. Men were restless and it was necessary that negotiations should be speeded up.

The right to withhold his labour was the prerogative of the employee, but when a strike was called by workmen who endeavoured to back their unofficial views by threats of violence to those of a more reasonable mind, then such action was unjust.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £210 0s 0d
Fire Refined 99·7 per cent ..	ton £209 0s 0d
Fire Refined 99·2 per cent ..	ton £208 10s 0d
LEAD, English	ton £161 0s 0d
MERCURY	flask £73 10s 0d
TIN	ton £1,140 0s 0d
ZINC, G.O.B. Foreign	ton £160 0s 0d
Electrolytic	ton £164 0s 0d
BRASS Tubes	lb 1s 10½d
Sheet	lb 2s 2d
Wire	lb 2s 4½d
COPPER Tubes	lb 2s 0½d
Sheet	ton £260 0s 0d
H.C. wire and strip	ton £235 5s 0d
PHOSPHOR BRONZE Wire	lb 3s 5d
RUBBER, No. 1 R.S.S. spot ..	lb 43d–43½d

Catalogues and Lists

Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W.1.—Technical folder describing the new Model 8 universal "Avometer."

Kelvin & Hughes (Industrial), Ltd., 2, Caxton Street, London, S.W.1.—Technical brochure on the Kelvin (Klinkhoff type), loss-meter with flue gas analyser for the estimation of combustion efficiency by analysis of heat losses.

Quasi-Arc Co., Ltd., Bilston, Staffs.—Technical brochure on the "Unionmelt" automatic welding process.

Addison Electric Co., Ltd., 163, Holland Park Avenue, London, W.11.—Two technical leaflets, one on an induction tracer for locating underground cables, etc., and the other on the associated oscillator unit.

Ransomes & Rapier, Ltd., Waterside Works, Ipswich, Norfolk.—Three technical folders on mobile cranes and portable electric winches.

TRADE MARKS

RECENT applications for the registration of trade marks include the following, objections to which may be entered up to the dates indicated.

2nd June

RALLY. No. 695,745, Class 8. Electric shaving instruments, etc.—J. A. G. Malmberg, Stockholm. Address for service, c/o Mewburn, Ellis & Co., 70-72, Chancery Lane, London, W.C.2.

ANTIFERENCE. No. 686,097, Class 9. Radio and television aerials and masts, parts and fittings, all included in Class 9; electrical plugs and sockets therefor; and radio interference suppressors.—Antiference, Ltd., 67, Bryanston Street, London, W.1.

ICONOTRON. No. 693,675, Class 9. Pick-up tubes, iconoscopes monoscopes and image-converter tubes (all parts of television apparatus) and television cameras.—Cathodeon, Ltd., Meadowcroft Laboratories, Church Street, Cambridge.

VACMASTER. No. 696,765, Class 9. Electric vacuum machines and electric domestic polishing machines, and parts included in Class 9.—A. M. Scheid, E. M. Scheid and W. M. Scheid, trading as Vorwerk & Co., Wuppertal-Barmen, Germany. Address for service, c/o H. A. L. Venner, 1, Great James Street, Bedford Row, London, W.C.1.

MONDOLITE. No. 695,624, Class 11. Lighting fittings.—Troughton & Young (Lighting), Ltd., 143, Knightsbridge, London, S.W.1.

BUDGET LITE (design). No. 695,911, Class 11. Fluorescent lighting fittings.—Ainsworth Lighting, Inc., Long Island City, N.Y. Address for service, c/o Frank B. Dehn & Co., Kingsway House, 103, Kingsway, London, W.C.2.

9th June

GIBSELEC. No. 694,112. Class 9. Junction boxes for use in electric wiring installations.—J. W. Gibson, Old George Yard, Cloth Market, Newcastle-on-Tyne.

COMBIMET. No. 695,175. Class 9. Electrical contacts and electrodes for electric welding.—Metro-Cutanit, Ltd., 160, Piccadilly, London, W.1.

FLUXARC. No. B695,616. Class 9. Electric arc welding apparatus (other than machines) and parts thereof included in Class 9, and electrodes for electric arc welding.—Sarazin & Cie., Neuilly-sur-Seine, France. Address for service, c/o D. Young & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

London Electricians' Dispute

Report of Court of Inquiry

THE Court of Inquiry set up by the Minister of Labour and National Service to investigate the causes of the dispute between the Electrical Trades Union and the London Electricity Board has presented its report (Cmd. 8232, H.M. Stationery Office, 6d).

This dispute originated at the Bethnal Green depot of the London Electricity Board. A member of the Transport and General Workers' Union (Mr. Backman) employed by the Board as a mains labourer was "up-graded" to the position of electrician's mate and transferred to the contracting department. An electrician, a member of the E.T.U., was instructed to take Mr. Backman as his assistant. He refused to do so and was suspended, without pay, whereupon eighteen members of the E.T.U. at Bethnal Green stopped work and later the dispute spread to other London depots and to three other Electricity Boards until 2,000 men were involved. The strike was "recognized" by the E.T.U.

Primarily Trade Union Matter

In its conclusions the Court of Inquiry says that the superficial cause of the dispute at Bethnal Green was clearly the disagreement which arose over the trade union membership of Mr. Backman. This was primarily a matter not for the management but for the trade unions concerned to settle, through the machinery provided for that purpose within the trade union movement. Although, the Court says, it appreciates the dilemma in which the L.E.B. was placed, it thinks that the Board would have been wiser to aim at diverting the dispute into those channels instead of intervening at an early stage.

Under the procedure for inter-union transfers recommended by the General Council of the Trades Union Congress, the union to which the man concerned wishes to transfer is under an obligation to consult his existing union before accepting him into membership. It is regarded as most unfortunate that this procedure was not followed in the case of Mr. Backman. The E.T.U. argued that he never formally applied to it for transfer, but the situation must have been clear to everyone in the Installation Department at Bethnal Green, and it would have been a simple matter for the E.T.U. to apply to the Transport and General Workers' Union for Mr. Backman's transfer if it so wished. It is true that the T.G.W.U. would probably have refused such a request; but in that event the matter could have been referred for settlement to the Disputes Committee of the T.U.C.

The Larger Issue

It is obvious, however, that the underlying dispute about union membership was and is the much larger issue. The claim of the E.T.U. for separate negotiating machinery in respect of the men employed in the contracting departments of Area Boards is the method by which it hopes to achieve this purpose. It was admitted by the E.T.U. that the Bethnal Green dispute itself could have been quite easily settled, but the fundamental difficulty would still have remained. This was really the issue before the Court.

The case of the E.T.U. for separate negotiating machinery rests mainly upon the contention that, in its own words, "the contracting departments of the Area Boards of the British Electricity Authority are an integral part of the contracting industry." This contention was not borne out by the evidence which was put before the Court. It is true that these contracting departments do the same work as private electrical contractors and are in direct competition with them, but there are two important factors which in the Court's view are fatal to the argument of the E.T.U.

First, according to figures put before the Court by the B.E.A. (and not disputed by the E.T.U.), practically all electricians in Area Boards' contracting departments are employed under "supply" conditions, and approximately two-thirds of them are are employed on "supply" rates. This

position has arisen largely through the E.T.U.'s own initiative, of which the negotiations at Bethnal Green in 1943 were one instance.

Secondly, interchangeability between supply and contracting work is a widely established practice so far as the employees of the Area Boards are concerned; sometimes, as at Bethnal Green, the men in the so-called "Contracting Department" are employed more on supply than on contracting work. Such interchangeability is clearly a most desirable and sensible arrangement, especially at the smaller depots. Complete segregation of supply and contracting activities as suggested by the E.T.U., while it might be practicable in some cases, would in general be a retrograde step and one which, as some of the other unions pointed out, might well operate to the workers' disadvantage in times when business was slack.

Accordingly, the Court is of the opinion that the E.T.U. has not established a valid claim for entirely separate negotiating machinery in respect of the men employed in contracting departments of Area Boards. (The case of the building trade workers, who form a group of trades quite separate from the rest of the electricity supply industry, does not seem to the Court to be analogous.) The B.E.A. has suggested that a separate sub-committee, on which the E.T.U. would have a preponderance of representation, might be set up within the supply industry "machinery" to deal with questions affecting employees in the contracting departments. The Court thinks that this would be a reasonable way of recognizing the special position of these employees within the supply industry. The objection of the E.T.U. to such an arrangement is that the sub-committee's recommendations would have to be endorsed by the whole N.J.I.C., but this objection is of theoretical rather than practical importance. If joint machinery is operated by all concerned in a proper spirit of co-operation and goodwill, the recommendations of such a sub-committee would not be overturned by the parent body unless for some exceptional reason. In practice an arrangement of this sort would provide the E.T.U. with proper safeguards and an adequate degree of autonomy in respect of these employees.

In conclusion, the Court says that while it has expressed certain opinions as to the setting up of joint voluntary machinery, it would emphasize that not only the form of such machinery, but also the manner in which it is operated, are matters which only those within the industry can determine. It urges upon all the parties concerned "the need to approach these problems in a spirit of co-operation and goodwill and thus foster the harmonious working of this great nationalized industry."

Electricity in the Orkneys

SPEAKING at the opening of the North of Scotland Hydro-Electric Board's Kirkwall diesel generating station on 15th May, Mr. Thomas Johnston, chairman of the Board, said that the Hydro-Electric Board would continue to do all in its power to make life more tolerable and happier in the rural areas. The Board's difficulties, however, were increasing. When it took over the Orkney undertaking in 1946, diesel oil was selling at £11 13s per ton, whereas to-day it was £17 10s. Copper for transmission was £96 per ton in 1946 and £235 now. As 240 tons had been used on the island of Orkney alone, that was an increase on the cost of wire of £33,000. It was not unreasonable, therefore, that consumers should be asked to give a guarantee of adequate consumption. Since 1948, the Board had connected 55,000 consumers in the Highland area, or one third of the potential consumers in the area. Mr. Johnston said that he hoped the new power station building would be an example of what could be done with the beautiful stone of the countryside so that they could begin the resuscitation of a great industry—stone quarrying and masonry.

In declaring the station open Mrs. Woodburn said that for generations progress was practically confined to the factory. In the home the woman still did the work literally on her hands and knees. The new station would symbolize the revolution in the home; already in Orkney there were 736 electric cookers among a total of 2,294 domestic consumers.

The Kirkwall station has been built on land reclaimed from the Peerie Sea, a land-locked bay at Kirkwall. It has an initial capacity of 3,520 kW but can house up to 10,000 kW of plant.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Illuminated Screwdriver

A COMBINED screwdriver and torch has recently been introduced by SPOT TOOLS (LONDON), LTD., 27, Adam and Eve Mews, London, W.8. This handy tool measures approximately 8in in length and by rotating the end of the barrel, which contains two U12 type cells, a beam of light is directed on to the work through a translucent plastic head into which the shaft of the driver is fitted. The "Flash-driver" is priced at 7s 6d.

Among other products of this company shortly to be marketed is a range of plastic, non-inductive, illuminated tools specially designed for use in the construction and maintenance of radio circuits.

Earthing Seal for Cables

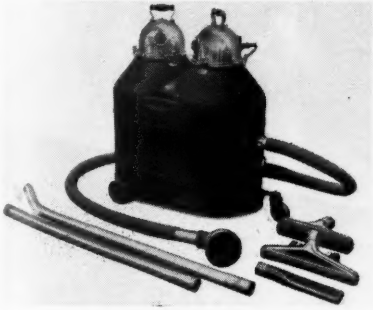
An interesting form of cable gland packing has recently been put on the market by CRANE PACKING, LTD., 45, Berwick Avenue, Slough Trading Estate, Slough, Bucks. Not only will it prevent the ingress of moisture or other contaminant, but it is a good electrical conductor. Known as style SS2E, it consists of a semi-plastic bonded material which is liberally impregnated with copper dust by a special process.

Industrial Vacuum Cleaner

Especially high powered portable suction cleaning plant has been developed by NEW WELBECK, LTD., 94, New Bedford Road, Luton, for industrial cleaning problems beyond the scope of ordinary machines. Models are available with two or three motor units, which are detachable and interchangeable and can be operated together or independently.

A large-bore hose and comprehensive range of accessories enables the plant to deal effectively with all factory dust and dirt including sand, soot, sawdust, etc. The twin motor machine costs 130 gns, and the three motor unit is priced at 175 gns with one set of main attachments and 190 gns with two sets of main attachments to enable two operators to use the machine simultaneously. Additional small attachments are available at a cost of 10 gns.

Right: **G.E.C. soil sterilizer and greenhouse heater**
Below: **New Welbeck twin motor cleaner**



Soil Sterilizer and Greenhouse Heater

A novel feature of a combined soil sterilizer and greenhouse heater made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is the 1½ kW plate-type resistance heater which ensures uniform distribution of heat throughout the soil. The current is confined to an embedded sheathed-wire element and the surface of the plate does not carry current.

One bushel (approx. 1 cwt) of soil can be loaded into the top and is removed by opening the bottom. A hole is provided in the cover for inserting a thermometer. Sterilization is completed in about 1½ hours with a power consumption of approximately 2¼ kWh of electricity. When used for greenhouse heating, the

apparatus will give a maximum house temperature of about 49 deg F in a greenhouse of 250 cu ft with an outside temperature of 25 deg F. Humidity may be increased by reversing the cover and filling it with water.

The interior of heavy gauge steel is galvanized after manufacture, double cased to provide thermal insulation. The dimensions are 2ft by 2ft 6in by 10in and the price is £14 10s (thermostat £2 3s extra).

Temperature Control Equipment

Three types of industrial temperature control equipment are now available from ELCONTROL, LTD., 10, Wyndham Place, London, W.1. All three are electronic, their sensitivity and speed of operation being limited only by the characteristics of the temperature sensing devices used. One unit is a photo-electric controlling pyrometer while the other two are thermocouple and resistance thermometer operated respectively.

They are "on/off" controllers, giving relay operation at the desired temperature which enables any load to be switched, either directly or through an intermediate contactor. The circuits avoid complications, and are designed to give reliability, stability and long life. The control equipments are housed in robust dust and moisture proof cast alloy or heavy gauge welded sheet steel cases.

"Utility" Vacuum Cleaner

With the object of keeping the price as low as possible, the new "Goblin" G.37 outside bag type vacuum cleaner has had all the "frills" omitted. The brush, which is driven by one of the tyred rubber wheels, is not adjustable in the ordinary way but its position in relation to the carpet can be altered by unscrewing the nut on the rear wheel. No provision is made for the use of attachments. The machine, which is made by the BRITISH VACUUM CLEANER & ENGINEERING CO., LTD., Leatherhead, costs £11 5s 11d (plus £5 10s 1d P.T. in this country).

Miniature Circuit Breakers

A series of miniature circuit breakers which are available from DORMAN AND SMITH, LTD., Ordsal Electrical Works, Manchester, 5, are suitable for the protection of circuits and equipment up to a maximum current rating of 50 A at overloads up to 500 V a.c. or 250 V d.c. The ordinary overload tripping may be instantaneous or have an inverse time delay characteristic, but in all cases instantaneous tripping occurs on a large overload or short circuit. At present four models are available with capacities of 5, 15, 30 and 50 A respectively.

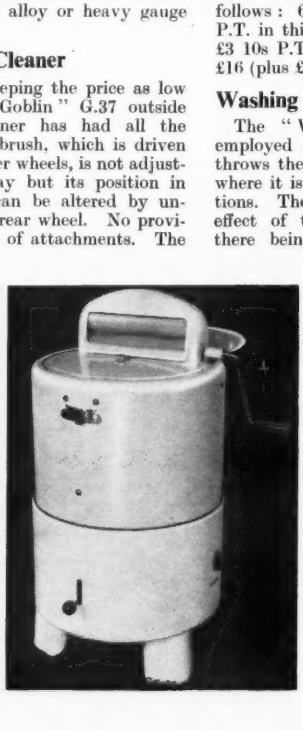
Electric Blankets

Features of the "Vigilux" electric blankets made by the WARM-GLOW CO., LTD., 1133, London Road, Leigh-on-Sea, are the continuously variable temperature control with two-pole mains switch and night illumination; longer elements, with faster action, and closer voltage ranges; and a double-bed version with twin independent controls. Prices are as follows: 65in by 36in size, £9 8s (plus £2 7s P.T. in this country); 72in by 58in, £14 (plus £3 10s P.T.); 72in by 58in (double-bed type), £16 (plus £4 P.T.).

Washing Machine

The "Vortaction" principle of agitation employed in the "Merlin" washing machine throws the water against the inside of the tub where it is deflected by means of small projections. The clothes are thus washed by the effect of the water passing through them, there being no abrasive action. A slipping clutch prevents overloading.

Although it is small (30½in high by 18in in diameter) the machine is said to hold 11 lb of dry clothes. A pump is provided for emptying and the hand operated wringer, which has independently sprung rubber rollers, folds inside the tub when not in use. The tub is vitreous enamelled and the base stove enamelled, all in white. The machine, which costs £31 10s (plus £15 15s P.T. in this country) is obtainable from the sole distributors, WITLOR, LTD., 132, Lancaster Street, Birmingham, 4.



Left: **"Goblin" G.37 vacuum cleaner**
Right: **"Merlin" washing machine**

ELECTRICITY SUPPLY

Power Station Schemes Approved

Further Tariff Changes

CONSENTS for the establishment of two new power stations at Blaydon-on-Tyne, Durham, and an extension of the new Brunswick Wharf station which is now being built, have been received from the Minister of Fuel and Power by the British Electricity Authority. The two new Tyne plants will be known as the Stella North and Stella South power stations. The consent for the former covers the installation of four 60 MW turbo-generator sets, four 550,000 lb/hr boiler units and four cooling towers and the consent for the latter covers five 60 MW sets and five 550,000 lb/hr boiler units. The ultimate installed capacities of these stations will therefore be 240 MW and 300 MW respectively.

The extension at Brunswick Wharf power station, which will have an ultimate capacity of 330 MW, will consist of a 60 MW turbo-alternator and two 320,000 lb/hr boilers.

Proposed Power Station at Elton

Cheshire County Council has been informed by the Ministry of Fuel and Power that the fullest consideration has been given to the objections of the County Planning Committee to the proposed erection of a generating station at Elton in the Chester rural district, but it is felt that the reasons put forward against the development do not justify the withholding of planning permission for this most important project.

275 kV Line

Hexham U.D.C. is objecting to the siting of towers for the new 275 kV line to be built from Glasgow to Newcastle which will pass through the Hexham area. The line will be carried on towers 110ft high which the Council contends will interfere with the area's amenities.

Cumberland County Council has approved in principle the erection of a 275 kV overhead line in its area. The matter will be considered further when details are submitted of proposed towers, etc.

Electricity in Schools

The London County Council Education Committee proposes to invite tenders for the installation of electricity in nine primary and secondary schools (one used partly as a special school) and one special school, in the third group of the fifth programme for this work. Of the total estimated expenditure of £38,900 it is expected that £30,000 will be incurred in the current financial year and the remainder in 1952/53.

Large American Sets

The *Electrical World* reports that the Public Service Electric & Gas Co., Newark, New Jersey, plans to install two 145 MW turbo-generators at its Kearny station. These units will generate power at 20 kV and will be designed for steam at 2,350 lb/sq in at 1,100 deg F, 1,050 deg F re-heat. Each will have a 950,000 lb/hr steam generator with forced circulation, designed to burn pulverized coal, oil or natural gas.

Development in Quebec

In his annual Budget address in the Quebec Legislature Assembly, the Provincial Treasurer (Mr. Gagnon) said that the hydraulic resources of the province remained the king-pin of its present-day industrial development. The construction of more than seven new dams would be undertaken in 1951 at a cost exceeding $200 million.

New Midlands Tariffs

The Midlands Electricity Board has announced new tariffs to come into operation after the first normal meter reading after 3rd June. Except for large commercial and industrial premises, these will be block tariffs. For a private house the user will pay for all electricity used for all purposes 4d/kWh to a total of 12 kWh per room per quarter, and ¾d/kWh for subsequent consumption. Meter rents are to be abolished, except that if an extra meter is installed at the consumer's request, a hire charge will be made.

The block type tariff available for those premises which combine a residence and shop, or for consumers such as doctors and dentists who use part of their private residence as a consulting room or surgery, will be similar to the tariffs for private houses, except that the user will pay for electricity for all purposes at 4d/kWh for 12 kWh per room used for private purposes, and 40 kWh per 100 sq ft for that part of the premises used for business purposes. All energy used over that total number will be at ¾d/kWh. Consumers in smaller commercial and industrial premises will pay 3d/kWh up to 40 kWh per 100 sq ft of floor area, and 1d/kWh for all over 40 kWh per 100 sq ft.

The residential part of small commercial and industrial premises will have the same tariff as for private houses.

Farm premises will be charged in a similar manner to the smaller commercial and industrial premises, except that the user will pay 4d/kWh to a total of 30 kWh per 1,000 sq ft of floor area of buildings, and 1d/kWh for all over 30 kWh per 1,000 sq ft. The tariff for the farmhouse will be the same as for private houses.

For larger commercial and industrial premises a maximum demand form of tariff will be used.

North Eastern Tariff Revisions

With the object of simplifying and standardizing the methods of charging for electricity in its Area, the North Eastern Electricity Board has devised new tariffs which are to come into force at dates to be announced later. In fixing the new tariffs the Board has taken into account increased costs which necessitate higher charges; for individual domestic consumers the increase will range from 1¼d to 6½d a week according to the size of house and extent of use of electricity. The desirability of discontinuing the higher prices charged in rural and outlying areas was taken into consideration and the revisions provide that all similar classes of consumers shall pay the same prices irrespective of location, except that consumers at a distance from the Board's mains will be required to contribute in cash, deferred payments or additional fixed charges towards the cost of connection. The principal tariffs will be as follows :—

Domestic

Two-part. Quarterly fixed charge of 3s for each assessable room (max. 45s), plus ¾d/kWh, less 2½ per cent prompt payment discount.

Block. Initial charge of 4d/kWh for the first 9 kWh a quarter per assessable room (max. 135 kWh), followed by a similar block at 2d/kWh and further consumption at ¾d/kWh, with a 2½ per cent p.p. discount.

Prepayment. 6d/kWh with 20 per cent rebate at time of collection.

Load-rate prepayment. 6d/kWh when load does not exceed 400 W and 1¼d/kWh when it is in excess of this figure, with a 15 per cent rebate.

Farm

Fixed charge at rate of £1 17s 6d/quarter for each £100 capital spent by Board in making supply available (tariff not applicable above £1,000). No fixed charge payable for supplies from l.v. and h.v. general distribution system unless service line exceeds specified limits. Consumption charged at 4d/kWh for first 100 kWh/quarter, 2d for next 100 and ¾d thereafter. (In case of supplies from h.v. system, blocks depend on transformer capacity). The first and second blocks will be added to those for the farm house to give a single tariff. P.p. discount 2½ per cent.

Shop Supplies

Variable block tariff based on floor area; assessed area taken as "selling area" plus 25 per cent of "non-selling area." First 15 kWh/quarter for each 50 sq ft or part at 4d/kWh; next 20 kWh at 2d/kWh and all in excess at 1¼d/kWh, less 2½d p.p. discount.

Street Lighting in Rio de Janeiro

Some time ago the Rio de Janeiro Tramway, Light & Power Co. asked British, American and French firms to provide demonstrations of highway lighting. As a result it was decided to use equipment proposed by the British Thomson-Houston Co., Ltd. It was announced last year that more than 300 lanterns were to be used, making the scheme one of the largest of its kind in the world, but since then extensions have been authorized on such a scale that sections now completed or for which equipment has been ordered will make use of a total of 662 B.T.H. Type SL.750 lanterns. These are designed to accommodate three 5ft 80 W fluorescent lamps, but owing to power shortage in Rio only two lamps are so far being used. In some cases, where the entire width of the carriageway is in full use, there are lanterns on both sides of the road, and in other sections where only one side of the road is completed a single row of fittings is used. Power supply from 6,300 V overhead lines is stepped down to 250 V (one transformer serving twenty lanterns) and in the lanterns themselves each lamp is individually fused. All the lanterns are being supplied by the B.T.H. Co. through their agents, Wilson Sons & Co., Ltd., of Rio de Janeiro, the suspension brackets being of local manufacture.

Section of the Avenida Brasil, Rio de Janeiro, showing B.T.H. fluorescent street lighting installation; owing to local power shortage only two lamps in each lantern are in use at present

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Brush Electrical Engineering Co., Ltd.—The report and accounts now published show a group net sales turnover of £19,995,431 for 1950, as compared with £15,570,803 for 1949. The net profit for the year, before deducting taxation, is £1,646,070 (against £1,307,485), to which is added profit adjustments arising from previous years of £46,791, making £1,692,861. Taxation absorbs £940,492, and the net profit attributable to the Brush Electrical Engineering Co. is £616,787 (£653,878). General reserve receives £400,000. It is proposed to pay a final ordinary dividend of 6 per cent, making 10 per cent for the year (unchanged). During the year the ordinary stock was increased from £1,600,000 to £2,400,000 by a cash issue.

The report refers to the need for further new cash capital, and states that notwithstanding the introduction of the additional ordinary capital within the year and the retention of the major part (over £450,000) of the net earnings for the year, the calls on the group's finances to support its expanded activities have involved an increase in the current liabilities. The capital commitments of the group as at 31st December last, not provided for in the accounts, totalled approximately £900,000, of which £130,000 represents commitments of the holding company, which has also undertaken commitments for the acquisition and financing of overseas subsidiary companies involving £300,000.

In his statement issued with the report and accounts, Sir Ronald W. Matthews (chairman) refers to the acquisition during the year of the Hopkinson Electric Co., Ltd., and further acquisitions of shares in the National Gas & Oil Engine Co., Ltd., giving the company just over 60 per cent of the ordinary share capital. Other acquisitions during the year include Vivian Engine Works, Ltd., and Vivian Diesels and Munitions, Ltd., Canadian companies. In certain major overseas areas field advisory companies have been established.

Reviewing the manufacturing side of the group, Sir Ronald says that in the Turbine Department of the Brush Co., substantial progress was made on the Ljungström reconstruction programme for the British Electricity Authority. New blading to the extent of 248 MW was completed, including that for the first 40 MW set to be recommissioned. Further orders have been received for sets up to 30 MW capacity. Orders for Ljungström sets have also been received for installations in stations overseas, including Jamaica, Lagos and Bangkok. There has been a satisfactory flow of orders, particularly from abroad, for axial flow turbines. Transformer output reached a new high level, the largest unit supplied being rated at 30 MVA 132 kV for the B.E.A. A line of impulse testing units has been developed and new design techniques evolved. A new high voltage laboratory is under construction and will be in operation shortly. The switchgear range has been extended to include circuit breakers and isolating switches at 33 kV. Orders received for diesel-electric locomotives include one of over £1,000,000 for 25 main line 1,250 h.p. locomotives from the Government of Ceylon.

Dealing with the other companies of the group, the chairman says that Hopkinson's have developed a standard range of lighting generators for which valuable orders have already been booked. The production of Mirrlees, Bickerton & Day shows an increase of nearly 50 per cent over the 1949 figure, and J. & H. McLaren, Ltd., have extended their range of standard generating sets which now covers outputs from 27 to 110 kW. The production of small diesel and petrol engines at Staines by Petters, Ltd., shows an increase of approximately 55 per cent over the previous year and Bryce Fuel Injection, Ltd., has increased its turnover by 45 per cent.

C. A. Parsons & Co., Ltd.—The annual meeting will be held on 6th June. In his circulated statement Sir Claude D. Gibb (chairman and managing director) says that all previous records of production have been passed by a considerable margin. Output and sales both at home and abroad were again a company record. It is necessary to sound a note of warning, however. Much of the material required for the 1951 output has already been received, but the deterioration in the supply of materials during the past three months is a matter of grave concern. The value of work in progress exceeds £5 million, and with such a volume of material in flow through the works any hold-up due to material deficiencies must have a disastrous effect upon output and manufacturing costs. Reference was made last year to the order received from Ontario Hydro for two steam turbo-alternators each of 100,000 kW output. During 1950 orders were received for two more units

similar to the two under construction. Further orders have been received from Australia, where their total turbo-alternators under construction or being erected now exceed a million kW. South Africa also has ordered additional plant, the outstanding order being for the new Taaibos power station, where they are to supply six units each of 60,000 kW. During 1950 a wholly owned subsidiary company (C. A. Parsons & Co. (Rhodesia), Ltd.), was formed in Rhodesia. The works have been further improved and expanded during the year. The new shops for high pressure pipe fabrication were designed, built, and brought into production during the year and are now delivering equipment to power stations. A new bay for producing larger and higher voltage transformers will come into production during the current year and will enable transformers for 275 kV and higher voltages to be manufactured and tested. A new research and design building is also being erected.

The British Vacuum Cleaner & Engineering Co., Ltd.—In his address at the annual meeting on 22nd May, Mr. H. C. Booth (chairman) said that this year marked the 50th anniversary of the granting of his patent for the first vacuum cleaner, which resulted in the formation of the company. During the year under review the sales of their "Goblin" electric vacuum cleaners showed a considerable increase, and there was also a satisfactory advance in the sales of industrial clocks, time recorders and public address equipment handled by their subsidiary, the Magneta Time Co. Orders for the installation of B.V.C. ash and dust handling plant for power stations had increased and continued to show a further expansion both at home and abroad. This work was dealt with through their subsidiary, B.V.C. Industrial Constructions, Ltd. A substantial increase in the turnover of their products was recorded in the export field. Their turnover for the first six months of the current year again showed an increase and they had a healthy home and overseas order book in all sections of the business.

Richard Johnson & Nephew, Ltd., report a group trading profit for the past year of £1,100,944, compared with £749,883 for 1949-50. Depreciation absorbs £140,457, obsolescence £1,144, and taxation £553,629. It is proposed to pay a final ordinary dividend of 7⅓ per cent, making 9 per cent for the year on capital of £900,000 as compared with a total dividend for 1949-50 of 15 per cent on £300,000.

The London Electric Wire Co. & Smiths, Ltd., reports a group profit for 1950 of £768,536, as compared with £672,978 for the preceding year. After providing £436,209 for taxation, there is a net profit of £346,836, which includes £14,509 credit adjustments for previous years. General reserve receives £162,884 and dividend reserve £50,000. It is proposed to pay a final ordinary dividend of 6 per cent on capital as increased by a rights issue in December last, making 10 per cent for the year. The dividend for the previous year, on smaller capital, was also 10 per cent. The balance carried forward is £388,941 (against £344,679 brought in).

Sturtevant Engineering Co., Ltd.—Mr. G. R. Thursfield, chairman, stated at the annual general meeting that the company had made special endeavours in the national interest to expand export trade, and the group last year shipped goods to twenty-seven countries. With taxes at the present level, it was very difficult for industry to provide adequately out of profits for future expansion and replacement of plant and at the same time to distribute to shareholders a fair return on their investment. They were endeavouring to meet this situation by building up the general reserve. It was interesting to note that against £48,820 distributed to shareholders tax liability was no less than £271,000. Business continued very active and they had a full order book, but the difficulties they were encountering in obtaining certain raw materials might be accentuated by rearmament.

Heatrae, Ltd., reports a net profit of £9,415 for the year ended 28th February (after provision of £5,000 for taxation) compared with a loss of £246 for the previous year (no tax). A sum of £799 (£3,673) goes to deferred repairs charged against reserve and the dividend is maintained at 12½ per cent. The carry-forward is increased from £10,246 to £15,555.

The Watford Electric & Manufacturing Co., Ltd., is to raise £50,000 of new capital by "rights" issues to ordinary and preference shareholders. The preference issue is 32,000 6 per cent cumulative shares of 10s each at par, and the ordinary consists of 160,000 2s shares at 4s 3d each. Preference and ordinary are available to the respective classes in the proportion of two for nine held.

Lancashire Dynamo Holdings, Ltd.—Treasury consent has been received for a one-for-one scrip bonus issue by capitalizing £584,332 from the share premium account.

Telephone Rentals, Ltd., are renewing their application to the Capital Issues Committee for the right to issue 400,000 5s shares by utilizing part of the share premium reserve.

Newman Industries, Ltd., reports a trading profit for 1950 of £95,453, as compared with £123,828 for the preceding year, and a net profit of £3,994 (against £20,855). The ordinary dividend for the year is 6 per cent (against 10 per cent), and £88,403 is carried forward (against £93,153 brought in).

Ever Ready (Ireland), Ltd., reports a trading profit for the year ended 31st March last of £18,754, as compared with £16,796 for 1949-50. The ordinary dividend for the year is unchanged at 12½ per cent and £6,569 is carried forward (against £9,758 brought in).

New Companies

Electric "O" Appliances, Ltd.—Registered 19th April. Capital £2,000. To acquire the business of distributors and salesmen of electrical appliances now carried on by G. Smith and H. Smith at 186, Victoria Road, Scarborough, and 76, Grange Road West, Middlesbrough, as Electric "O" Appliances. Directors: G. Smith and H. Smith. Regd. office: 186, Victoria Road, Scarborough.

Gretton Ward & Co., Ltd.—Registered 18th April. Capital £10,000. Electrical and mechanical engineers, etc. Directors: M. J. Ward, W. R. C. Ward, F. E. Ward and S. F. Ward. Regd. office: Gretton House, Forest Hill Road, S.E.23.

Harry Bibby & Co., Ltd.—Registered 24th April. Capital £15,000. To acquire the business of an electrical engineer and contractor carried on by H. Horrocks at 26, Buttermarket Street, Warrington, as "Harry Bibby & Co." Directors: H. Horrocks, Margery Rimmer and J. H. Rimmer. Secretary: T. Cole. Regd. office: 26, Buttermarket Street, Warrington.

Stedman Electrics, Ltd.—Registered 30th April. Capital £1,000. Manufacturers and repairers of electrical and other machinery, and apparatus of all kinds, etc. Directors: P. W. S. Bulman and P. G. Child. Regd. office: 79, Eccleston Square, S.W.1.

E. J. Dawes, Ltd.—Registered 5th May. Capital £4,000. To acquire the business of fluorescent tube manufacturers carried on by F. W. Cottrell and D. Nobbs at Erimus Works, Stockton Street, Middlesbrough. Directors: F. W. Cottrell, Mrs. Mary E. Cottrell (secretary) and D. Nobbs. Solicitors: King and Thompson, Middlesbrough.

Forth Electric, Ltd.—Registered in Edinburgh 30th April. Capital £5,000. Electricians, electrical engineers, etc. Directors: E. Walker and J. S. Sinewright. Secretary: J. H. C. Wishart. Regd. office: 15, Hill Street, Edinburgh.

Increases of Capital

Liverpool Electric Cable Co., Ltd.—Increased by £200,000, in £1 shares, beyond the registered capital of £300,000. At 12th December, 1950, the London Electric Wire Co. and Smiths, Ltd., held 197,600 shares out of 200,000 issued.

T. Beadle & Co., Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £80,000.

Electrical Productions (Leeds), Ltd.—Increased by £10,000, in £1 ordinary shares, beyond the registered capital of £1,000.

Contactor Switchgear, Ltd.—Increased by £100,000, in £1 shares, beyond the registered capital of £50,000.

Zenith Electric Co., Ltd.—Increased by £48,750, in £1 ordinary shares, beyond the registered capital of £26,250.

British Electrical & Manufacturing Co., Ltd.—Increased by £35,000, in £1 ordinary shares, beyond the registered capital of £65,000.

Standard Wholesale Electrical (Supplies) Co., Ltd.—Increased by £3,200, in £1 ordinary shares, beyond the registered capital of £8,000.

Kango Electric Hammers, Ltd.—Increased by £50,000, in £1 unclassified shares, beyond the registered capital of £10,000.

Muirhead & Co., Ltd.—Increased by £100,000, in £1 ordinary shares, beyond the registered capital of £100,000.

Ega Electric, Ltd.—Increased by £20,000, in 1s ordinary shares, beyond the registered capital of £65,000.

Liquidations

Electrical Services (Cowley), Ltd., electrical contractors, Oxford.—At a meeting of creditors a resolution was passed confirming the voluntary liquidation of the company with Mr. R. F. Bendall, of Poppleton and Appleby, Birmingham, as liquidator, together with a committee of inspection.

Edgworth Electrics, Ltd., radio, television and electrical engineers, 98, London Road, St. Albans.—Liquidator, Mr. A. W. Hunter, 185-188, High Holborn, London, W.C.1, appointed 30th April.

Redgrave Engineering Co., Ltd., electrical engineers, Knighton Chambers, Aldwick Road, Bognor Regis.—Liquidator, Mr. J. S. Bradley-Hole, 7, Old Steine, Brighton, appointed 10th May.

Bankruptcies

D. N. Bateman, radio and electrical engineer, trading as "Villiers Electric," 1, North Villiers Street, Leamington Spa.—First meeting 30th May at the Official Receiver's Office, 37, Temple Street, Birmingham, 2. Public examination 20th July at the Shire Hall, Warwick.

J. Barnett and M. Barnett, trading as "Barnett Supplies Co.," 102 and 104c, Cranbrook Road, Ilford, radio, electrical, television dealers and contractors (separate application of J. Barnett).—Discharge suspended for two years from 16th April.

STOCKS and SHARES

STOCK Exchange markets have suffered a sharp check to their previous buoyancy, owing, this time, to the threatening developments in connection with Persia; to a slump in New York; to talk of rising money rates; and to various minor "bear" factors which came into focus. Stock Exchange men declare that there has been no great volume of selling, but that, in the face of the adverse conditions so generally prevailing, the earlier buying support was withdrawn and, in consequence, a moderate amount of selling exercised a disproportionate effect. Gilt-edged stocks have given way fairly heavily and, instead of there being a long list of rises to catalogue in the industrial group this week, the pendulum has swung in the opposite direction, with falls predominant.

Cable Results

Henley's Telegraph Works 5s ordinary shares at 24s 6d have lost $\frac{1}{16}$, since the company's decision to keep the dividend for 1950 at the same rate of 20 per cent as before. Enfield Cables £1 shares have receded a trifle to 33s since the marking-down which earlier followed a similar decision by that company, the rate in this case being $7\frac{1}{2}$ per cent. In each instance, expectations had evidently been banking on some relaxation of the highly conservative dividend policies of recent years. In the event, both companies report a moderate recession in the year's earnings, and, once again, the bulk of the surplus is going to the further fortification of already strong reserves. Henley's dividend distributions total only £184,000, against nearly £600,000 appropriated for reserves.

Prices and Yields

After the above price adjustments, the yields on Henley's and Enfield ordinary are, respectively, a little over 4 and $4\frac{1}{2}$ per cent. Among other cable manufacturing investments, B.I.C. ordinary at 37s give a round 4 per cent on the dividend as increased earlier this year from $6\frac{2}{3}$ to $7\frac{1}{2}$ per cent. In the case of Telegraph Construction, which also paid more this year, the £1 shares at 45s 9d afford nearly $4\frac{3}{4}$ per cent on the 11 per cent dividend basis, while Johnson & Phillips at 61s 3d give nearer 5 per cent. On London Electric Wire ordinary, which have been subdued around 50s since the declaration of the 10 per cent dividend, the return is 4 per cent. Siemens at 37s 6d give the same.

The conclusion to be drawn is that although the cables section of the electrical equipment market has produced some disappointments this year for the more impatient type of optimist, it has lost none of the confidence of the genuine investor.

C. A. Parsons' Conservatism

Full annual accounts now published by C. A. Parsons show that this company would be well in the running for any award which might be offered for the most conservative dividend of the year. With a surplus equivalent to something like 200 per cent gross on the ordinary capital, the 15 per cent dividend is covered by a margin even wider, for instance, than the ten-fold cover for the last Lucas distribution. The value of the policy can be seen from the balance-sheet, in which bank loans have been reduced by no less than a million during a year in which a great many companies have been sorely exercised to keep that type of liability from expanding. C. A. Parsons are committed to outstanding capital expenditure of over £800,000 and in his review the chairman gives a stern warning about the possible effects of any interruptions due to raw material shortages. Market valuation of the shares, at 92s 6d, on a $3\frac{1}{4}$ per cent yield basis, shows that the long term benefits of the dividend policy are properly appreciated.

Capital Proposals

Lancashire Dynamo's proposal to issue a 100 per cent free share bonus is in line with expectations formed two months ago, when the annual report referred to the disproportion existing between the capital issued and the amount actually employed. The £1 shares stand at £5$\frac{1}{2}$ to yield a little over 4 per cent on the $22\frac{1}{2}$ per cent distributions which have been paid, from rising earnings and on increased capital, since the war. Watford Electric are raising new money by the offer of equal amounts of preference and ordinary shares to present holders on a two for nine basis, the former at par and the 2s ordinary at 4s 3d. With the present 2s shares at 7s 9d, rights to the new are worth approximately 7d per share. The dividend was raised last month from 20 to 25 per cent. A reference to future capital requirements is made in the Enfield Cables' annual report.

The Week's Price Changes

Amongst the falls which have occurred London Electrics at 50s are 4s 6d down, and Siemens, 36s 3d have lost 3s 3d. Johnson & Phillips, 62s, fell 1s 9d. Falls lowered General Electrics to 91s 3d, and Associated Electric to 96s 3d. Murex are down 1s 6d at 57s, Scottish Cables at 26s 6d and Madras Electrics at 31s. On the other hand, Oriental Telephones rose $\frac{1}{8}$ to 55s. Ericsson, 53s 9d, Tube Investments, $7\frac{1}{8}$ and Walsall Conduits 62s 6d are all $\frac{1}{16}$ better.

Hydrogen Coolers for Generators

Techniques Developed by Metropolitan-Vickers

DEVELOPMENTS in the design of large generators have necessitated a new approach to the problems of cooling. In generator closed-circuit ventilation systems, a suitable gas absorbs heat from the machine and is then cooled before recirculation. Highly efficient water-tube coolers have been developed for use with air, but the more recent adoption of hydrogen as a ventilating medium has involved the establishment of new techniques in the design and installation of cooling systems.

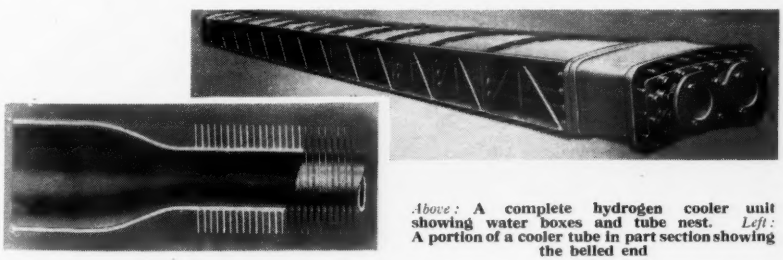
For generator cooling, the advantages of hydrogen as compared with air arise from the different physical characteristics of the two gases. Not only does the lower density of hydrogen afford a significant reduction in generator windage losses, but also, because of its greater thermal conductivity, hydrogen reduces thermal gradients between adjacent parts of the machine. Furthermore, hydrogen has a higher coefficient of heat transmission and thus more readily absorbs and rejects heat in the cycle of the cooling system.

An important difference between hydrogen and air systems is that air-leakage into or out of an air system is relatively unimportant, but leakage in a hydrogen system has an adverse thermal and economic effect on performance. It follows that for hydrogen both generator and cooling system must be gas-tight, and a convenient method of construction is to incorporate generator and hydrogen coolers in a single gas-tight casing. For this reason, and because of the different gas characteristics, the coolers for hydrogen systems differ from the more familiar air coolers both in appearance and construction.

On large generators one convenient method of arranging the hydrogen coolers is to group the units around the periphery of the stator yoke. In this arrangement, which was first employed on the pioneer hydrogen-cooled generator in Great Britain, a 75,000 kVA 3,000 r.p.m. Metropolitan-Vickers machine installed in 1949 in Littlebrook "B" power station, the tubes are parallel to the axis of the machine and the units are substantially of the same length as the generator. To limit the overall diameter of the casing, the radial width of the coolers is reduced to a practical minimum.

A complete cooler unit, as used in two generators at Littlebrook and in another machine of the same make that will soon be in service at Battersea, is illustrated. The unit consists of a nest of finned tubes with water boxes and removable covers. Each tube is supported at frequent intervals along its length and the ends are expanded into tubeplates; to enable individual tubes to be renewed, adjacent tubes are belled at alternate ends to a diameter greater than the fins and supporting collars.

The cooler units are then secured to the generator casing by special end mountings incorporating bonded rubber seals. These, together with a flexible member at one end of each side frame, permit differential expansion between the tubes and the casing. By providing cooler units with water boxes and removable covers at both ends, it is



Above: **A complete hydrogen cooler unit showing water boxes and tube nest.** *Left:* **A portion of a cooler tube in part section showing the belled end**

possible to clean the water side of a unit while the generator is running at reduced load.

The other illustration shows that the tube is fitted with plain fins. Although tubes fitted with wire loops provide the most efficient surface for heat transfer, a plain finned tube is favoured for hydrogen coolers because it offers less resistance to gas flow and a higher gas velocity may be employed for a given pressure drop through the cooler. A high gas velocity permits a reduction in the radial width of the cooler units and thus with installations where the units are grouped round the periphery of the stator yoke the diameter of the casing is reduced.

AUSTRALIAN NOTES

From Our Own Correspondent

FROM a detailed examination which takes into consideration not only the quantity but the quality of power resources in each Australian State, it appears that South Australia and Western Australia are the worst off with regard to basic power resources. The Research Service of Sydney, which recently made a full survey of electric power potentialities in Australia, says that New South Wales and Queensland have black coal and large hydro-electric resources, Victoria has the largest deposits of brown coal and Tasmania has an extremely high hydro-electric potential for its size.

Australia's overall effective generator capacity is very much lower than that of the United States or the United Kingdom but higher than that of any Asian country except Japan. It occupies an intermediate position when compared with European countries. In 1949 the total effective capacity of generators in Australia was 2,025 MW, compared with the 69,486 MW of the United States and the 13,913 MW of the United Kingdom. Overall capacity of all power plants being installed at March, 1950, however, was 3,700 MW.

In the years from 1938 to 1949 Australian power production increased by 108 per cent—an extremely high increase compared with that of other countries, indicating the remarkable growth in the demand for power in Australia during the war and post-war years. Per head of population, Australia's output of electric power is comparatively high. In the space of three post-war years (1946 to 1949) it rose by 28·3 per cent, which was considerably higher than the increase over the same years in the United Kingdom, New Zealand, Canada, Sweden and South Africa. The survey predicts that the demand for electricity will increase considerably.

The Western Australian Minister for Electricity (Mr. Brand) says that electricity will definitely be generated by the South Fremantle power station within the next few months.

Throughout Australia recent sales of electric refrigerators, washing machines and other appliances have been extremely heavy since the Government paid ex-Service gratuities, and waiting periods for refrigerators are often as much as fourteen months. During January last retail sales in principal Sydney stores were 41·4 per cent higher than in January, 1950, sales of electrical goods having shown an increase of no less than 76·1 per cent. Stocks of electrical goods were reported to be up by 35·8 per cent.

The Victorian Government Statist reports that during the three months ended September 30th, 1950, imports included dynamo-electric machinery valued at £349,368 (£335,982 during same period of 1949); radio equipment valued at £42,992 (£20,725); and other electrical machinery, etc., valued at £1,790,463 (£992,602).

The Western Australian Government Statistician reports that for the same period, imports into that State included covered cable and wire valued at £110,155 (£48,425 from overseas); filament lamps valued at £33,013 (£7,593); radio equipment, £155,473 (£1,069); telephone and telegraph apparatus, £152,762 (£88,062); heating and cooking appliances, £24,409 (£3,029); other electrical equipment and appliances, £282,813 (£141,902); and dynamo-electric machinery, £210,676 (£107,176).

In order to secure employees the Victorian State Electricity Commission is erecting over 2,000 homes for married personnel. The number of Commission employees at 30th June last exceeded 18,000.

RADIOACTIVE ISOTOPES IN INDUSTRY

ON 1st May a conference was held at the Institution of Electrical Engineers in London on the use of radioactive isotopes in industry. This conference was organized by the F.B.I. Industrial Research Committee in conjunction with the Atomic Energy Research Establishment. The chairman was Sir Wallace Akers and the proceedings were opened by Sir John Cockcroft. Eight short lectures were then delivered by specialists in the various fields of application of radioactive isotopes. Among these Mr. A. M. Morgan (Enfield Cables, Ltd.), spoke on the applications of radioactive isotopes in the electrical industry.

Engineering in Europe

Survey of Current Literature

IT was discovered in the 'thirties by J. Bardot that certain kinds of mica, intended to yield mica powders, after thermal and chemical treatment, filtration and drying, did not remain in the expected powder form, but formed coherent sheets. After the discoverer's death this important fact was developed into an industrial process which permits of pulping the mica and working it on paper machines like wood pulp, resulting in a paper-like coherent sheet of very valuable properties. Above all, it is solid and truly homogeneous mica, which the natural mica sheets are mostly not. Compared with the conventional micaceous insulants, micanite and mica-folium, the "Samica" products have a superior dielectric strength ($\geq$ 15 kV) and loss factor in the yellow variety, and higher tensile strength, and lend themselves to being moulded or stamped into the shapes required. The temperature-relation of the loss factor of "Samicafolium" is much more favourable than that of ordinary mica-folium. For use in commutators, "Samicanite" has the following advantages over micanite : smaller specific mass ; excellent uniformity of thickness; higher compression resistance; approximately equal elasticity; better stamping properties; less hardness; and higher breakdown voltage.—"Samica, a Mica Paper," H. George and L. Metzger, *Révue Générale de l'Electricité*, Vol. 59, pp. 519–524, December, 1950, in French.

Electrical Contacts

The stressing of electrical contacts is determined by what is known as the arcing limit, above which a sustained arc leads to heavy losses of material by combustion and evaporation, whereas below this limit there is in general only a transfer of matter from anode to cathode ("migration"). It is possible to shift the arcing limit towards higher values by a "formation process," i.e., operation at the limiting current. An experimental set-up for the investigation of the migration process, the main part of which consists of a resonance relay (for preventing any "upsetting" of the contacts) is described, and it is therefore operated at currents below the limiting value. Bad cases of contact wear, leading to point formation, and examples of favourable, uniform stress and wear over the whole contact surface are discussed with reference to photographs and oscillograms. A particular case is represented by an Au-Ni alloy in which the direction of the migration is reversed at about 5 per cent Ni content; this makes the alloy "Au-Ni 5" particularly suitable, because its migration rate is very low. In experiments with contacts under arcing conditions the arc is extinguished after a certain period by an auxiliary contact, all the details of the operation being recorded on the oscillogram, which at the same time gives a record of the behaviour of the contact. Examples of the wear under these conditions are also given. In the case of the existence of a bridge of molten metal the migration is theoretically interpreted by the Thomson effect.—"Investigation of the Migration of Matter in Electrical Contacts," H. E. Linckh, *Elektrotechnische Zeitschrift*, Vol. 72, pp. 79–83, 1st February, 1951, in German.

Corona at 400 kV

The existing formulæ for corona losses, whether Peterson's, Peek's, or Mayr's, are unsuitable for very high voltages because the approximation to actual conditions obtained by them is in many cases quite insufficient. Especially the influence of atmospheric conditions is not properly taken into account by them so the present authors therefore carried out a new series of experiments on an experimental line with single and grouped conductors (of 27·7, 31·7 and 50 mm diameter and spacings of 450 and 400 mm). As the dispersion of the results is very considerable, even for similar weather conditions, average values were used for the evaluation which was based on the method of "partial similitude," i.e., on the assumption that for a given conductor diameter and air density the

corona losses are constant against a variation of the other parameters, if the field on the conductor surface remains the same. This actually leads to a useful empirical law based on the " relative air density δ " ($\delta = 3{\cdot}92\ b/T$, where b is the air pressure in cm Hg, T is degrees K). It is then $\delta\ \alpha/E_{max} = \text{const.}$, where α may have the value 1 or $\frac{2}{3}$, according to the character of the variations of air density and conductor diameter. It is then a general, approximate relation which is the condition for the corona losses to be equal for transmission lines of different types and thus the condition for transferability of experimental results to actual lines, even of different parameters.—" Calculation of the Corona Losses on 400 kV Transmission Lines," V. A. Venikov and D. A. Fedorov, *Elektrichestvo*, No. 1, pp. 10–14, 1951, in Russian.

Coaxial Discharge

It has been shown previously that in a uniform field at high pressures the disruptive voltage depends on the electrode metals and that the cold-cathode emission is responsible for this fact. The conditions in the non-uniform field between highly-polished coaxial cylinders of 13·6 and 5 mm diameter, respectively, have since been investigated. The inner cylinder consisted of stainless steel, copper, dural, nickel or chromium, the outer cylinder of stainless steel, copper or dural. Separate tests were made with oxidized dural and oxidized copper. The test voltage was 250 kV, produced by electrostatic generators of 250 μA output. After several hundred sparks the disruptive voltage becomes stabilized (electrode " formation " process). The disruptive voltage is always lower when the inner cylinder is the cathode. This polarity effect is about 45 per cent at 60 atm. with stainless steel electrodes. The voltage is a function of the electrode metal and sometimes anode as well as cathode affects it. With internal cathode, the maximum sparkover voltage is obtained with those metals whose work function is highest. Anode influence is then negligible. With dural, the oxidation has a marked effect. If the inner cylinder is the anode, it is more important than the cathode and sparkover voltage increases with increasing work function of the cathode metal. The anode influence can only be established if anode field is stronger than cathode field, and of an order of at least 1 mV/cm.—" Influence of the Electrodes in a Discharge between Coaxial Cylinders in Compressed Air," W. Bright, *Comptes Rendus des Séances de l'Academie des Sciences*, Vol. 232, No. 8, pp. 714–716, 19th February, 1951, in French.

Switchgear Insulation

The design of switchgear must always represent a compromise between the conflicting requirements of space-saving and satisfying the safety conditions prescribed by the regulations in force. The latter are not necessarily up-to-date, partly based on insulator types which may have been relinquished in the meantime and (this refers to German regulations) require unnecessarily high values of flashover test voltages, especially when applied to the barrel-shaped insulator which does not distort the electric field in an ideal dielectric. This leads to over-dimensioning of the insulation, e.g., 10 kV equipment has to withstand 60 kV flashover test voltage. On the other hand, the knowledge of surface leakage currents was only rudimentary at the time when many of the regulations still in force were drawn up, so that a revision of these on the basis of contemporary knowledge is now overdue. The author here shows on a particular example of insulators subjected to the most careful tests in every kind of contaminated condition that a particular 85 mm corrugated insulator warrants all the necessary safety and the kind of tests that should replace those required by the obsolete regulations.—" Dimensioning of Insulation as a Problem of Switchgear Design," K. Reiske, *Elektrotechnische Zeitschrift*, Vol. 72, No. 4, pp. 105–109, 15th February, 1951, in German.

Air-blast Current Rupture

It is possible to give a fairly good picture of the mechanism of circuit-breaking by using elementary thermodynamics and hydrodynamical similes. There are two possible cases: at low effective currents the whole energy liberated by the arc can be carried off by the air blast or, if the current is too high to permit of this, part of the energy is removed through the escape orifice and the remainder swept back through the air inlet. The limiting current between these conditions may be expressed

(*Continued on page 1115*)

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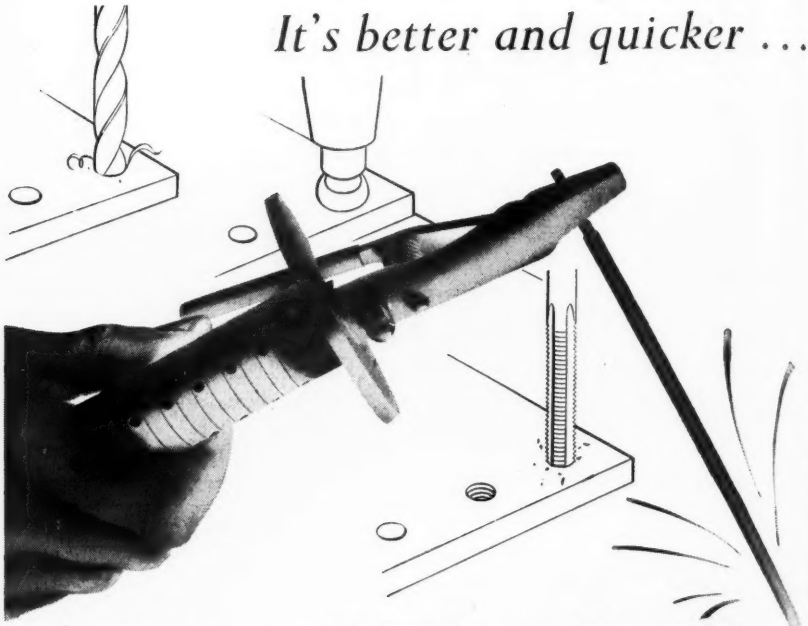

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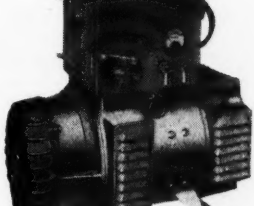

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by the simple relation $I_{eff.\ lim.} = 5{,}000\ S/L$, where S is the cross section of contracted arc column (cm^2) and L the useful arc length (cm), or break; the latter is, under certain conditions, independent of operating voltage and air pressure. The second phase of the rupturing process consists of two distinct periods; one in which the arc column is "planed down" by the outer air flowing past it at sonic speeds, the "chips" flowing off in eddy filaments. At the end of the wave, arc current decrease and narrowing of the column have increased the arc voltage as though an increasing resistance had been inserted in place of the arc. At current zero the thinning of the column quenches the arc and breaks the circuit, whereupon the voltage across the break reassumes the value of the operating voltage in the way described by D. C. Prince's theory. According to the latter, the condition for re-striking of the arc not to take place is:

$$\frac{p}{Vf} > K,$$

where p is pressure of the air blast, V service voltage and f natural frequency of the system. However, this holds good only if the above limiting current has not been exceeded, thus if there was no back-sweep, otherwise re-striking may occur.—"The Physical Mechanism of Current Rupture by the Air-blast Circuit-breaker," J. Labouret, *La Technique Moderne*, Vol. 43, No. 2, pp. 41–46, February, 1951, in French.

Industrial X-ray Equipment

THE latest industrial X-ray unit to be introduced by Philips Electrical, Ltd., is known as the "Compactix." It is entirely new in conception and the makers claim that it greatly simplifies procedure and leads to a speedier rate of inspection.

The X-ray unit proper is cylindrical and is divided internally by two insulating partitions. The h.v. energizing source comprises two specially designed transformers, each developing 100 kVp to earth. The transformers, together with the X-ray tube, are oil immersed, the tube being housed in the central compartment. The transformers are directly connected to the tube with which they are thus in series, an additional filament heating transformer being provided on the cathode side. The tube, which has a continuous rating of 200 kVp 10 mA, acts as its own rectifier and there are no valves or h.v. cables.

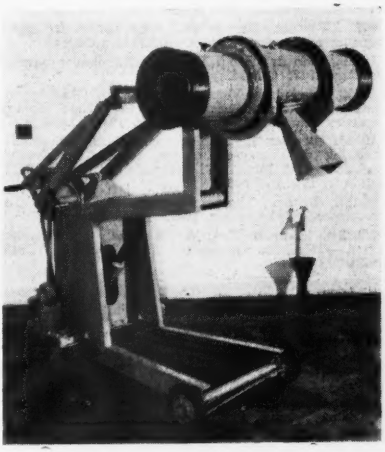
The X-ray beam emerges from a window in the wall of the container, the position of the focus being the geometric centre of the whole.

The control unit is small and designed to facilitate easy transport while reproducible operating conditions are made possible by means of a mains compensator, and a stepless auto-transformer, working in conjunction with a kilovoltmeter, enables the penetration to be controlled with a high degree of precision. The tube current, which can be varied, is indicated by a milliammeter. Cooling is normally effected from the water main, but a trolley mounted closed circuit system is available for use where the mains water supply cannot be relied upon.

The illustration shows the unit mounted on a truck with hydraulically operated raising and lowering gear, permitting a very wide range of vertical adjustment. For use in shipyards and on outdoor structures, the X-ray head is provided with slings so that it can be used independently of any other form of mounting. For such work the cylindrical form of the tube head permits of easy passage through a manhole.

The equipment is completely shockproof and fully protected, while its operation is unaffected by humidity or altitude. It has a radiographic penetration of 3in of steel in an economical exposure time, and is constructed to operate from single-phase 220–250 V 50–60 c/s mains.

Philips "Compactix" 200 kV industrial X-ray unit



NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1944

23085. Sperry Gyroscope Co., Inc.—High-frequency systems particularly for object detection and warning. 20th November, 1941. (654959.)

1945

16042. General Electric Co., Ltd., Foot, J. B. L., and Hawes, D. O.—Signalling systems, for example, for remote control purposes. 5th June, 1946. (655029.)

1946

788. Mohl, S.—Electrically controlled variable-speed drives. 9th January, 1946. (654960.)

14409. British Thomson-Houston Co., Ltd., and Owen, C. E.—Multivibrators. 13th May, 1947. (654923.)

17592. Faber, A., and Williams, D. R.—Electrodes and dielectric substances. 5th June, 1947. (654927.)

19071. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electrical generating systems. 26th June, 1946. (654928.)

27615. Lansing Bagnall, Ltd., and Arnot, A. E. R.—Electric motors and control installations therefor. 5th September, 1947. (654933.)

34270. British Thomson-Houston Co., Ltd.—High-frequency antennae. 19th November, 1946. (654935.)

1947

2662. British Thomson-Houston Co., Ltd. (General Electric Co.).—Follow-up control systems. 28th January, 1947. (654938.)

4426. Akt.-Ges. Brown, Boveri & Cie.—Magnetic induction accelerators. 14th February, 1947. (Cognate applications 4427, 13th September, 1943 and 4428, 17th September, 1943.) (654939.)

8237. Philips Lamps, Ltd.—Electron-discharge devices and circuits therefor. 26th March, 1947. (654943.)

9077. Western Electric Co., Inc.—Lenses for high-frequency radio waves. 3rd April, 1947. (654944.)

12718. Van der Heem N.V.—Suction cleaner nozzles. 10th May, 1947. (654945.)

15630. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electrical networks having linear sloping frequency characteristics. 13th June, 1947. (654946.)

18535. Reutter, J. L.—Electromagnetically driven self-regulating fluid compressor for use in refrigerating machines. 11th July, 1947. (Cognate application 18536, 26th July, 1946.) (654947.)

26687. British Thomson-Houston Co., Ltd.—Gas compressors. 3rd October, 1947. (654965.)

33693/4. Siemens Bros. & Co., Ltd., and Hensler, B. A.—Telephone systems. 29th October, 1948. (654848/9.)

1948

1856. Sperry Gyroscope Co., Inc.—Radio-beam navigation systems. 21st January, 1948. (654973.)

2602. Compagnie Générale de Télégraphie sans Fil.—Aperiodic electronic blocking valve. 28th January, 1948. (654974.)

5155. Siemens Bros. & Co., Ltd., and Hensler, B. A.—Telephone systems. 31st December, 1948. (654852.)

5738. Bailey Meters & Controls, Ltd.—Electrical calculating systems. 26th February, 1948. (654976.)

5988. Director of the Office of Technical Services, Department of Commerce.—Antennae. 27th February, 1948. (654978.)

6779. Sperry Corporation.—Apparatus for producing electric waveforms for use in adjustable delay- or time-measuring systems. 4th March, 1948. (654979.)

8793/5. Micafil Akt.-Ges.—Electrical condensers. 25th March, 1948. (654982/4.)

10518. General Electric Co., Ltd., and Dunham, G. R.—Electric circuit arrangements including saturable inductances or transformers to provide wave form and phase-changing and phase-shifting. 8th April, 1949. 654986.)

11107. English Electric Co., Ltd., and Ball, R. D.—Electro-hydraulic apparatus. 20th May, 1949. (654881.)

11385. Czechoslovak Metal & Engineering Works, National Corporation.—High-frequency oscillation generator using a gas- or vapour-filled discharge tube with controllable time of ignition. 26th April, 1948. (654989.)

11427/8. Standard Telephones & Cables, Ltd. (Bell Telephone Manufacturing Co. Soc. Anon.).—Telecommunication exchange systems. 22nd April, 1949. (654883/4.)

13836. Hazeltine Corporation.—Super-regenerative frequency-modulation receivers. 21st May, 1948. (654886.)

13837. Hazeltine Corporation.—Super-regenerative receiver. 21st May, 1948. (654887.)

14157. British Telecommunications Research, Ltd., and Bell, D. A.—Temperature control apparatus. 20th May, 1949. (654993.)

20597. Metropolitan-Vickers Electrical Co., Ltd., Kelsall, R. H., and Knowles, A. J.—High-speed counters. 10th June, 1949. (654892.)

20884. Webley & Scott, Ltd., and Smallwood, H. W.—Electric ventilating fans. 8th August, 1949. (Addition to 630391.) (654893.)

24690. British Thomson-Houston Co., Ltd.—Electric heating systems. 21st September, 1948. (654898.)

26444. Hazeltine Corporation.—Magnetostrictive time-delay device. 11th October, 1948. (654902.)

26445. Hazeltine Corporation. — Magneto-strictive signal-delay arrangement. 11th October, 1948. (654903.)

26464. General Electric Co., Ltd., and Willoughby, A. H.—Electric circuit arrangements for operating an electric discharge device from an a.c. supply. 10th October, 1949. (655000.)

27895. Standard Telephones & Cables, Ltd., and Reeves, A. H.—Electric delay devices employing semiconductors. 21st October, 1949. (654909.)

29244. Westinghouse Electric International Co.—Protective relaying systems. 10th November, 1948. (654913.)

29245. Westinghouse Electric International Co.—X-ray photofluorography. 10th November, 1948. (655013.)

31053. General Electric Co., Ltd., and Friedlander, E. S.—Electrical devices for measuring temperature. 24th November, 1949. (654918.)

31934. Lansing Bagnall, Ltd., and Arnot, A. E. R.—Electric motors and control installations therefor. 5th September, 1947. (Divided out of 654933.) (654951.)

32222. Sylvania Electric Products, Inc.—Apparatus for the assembly of indirectly-heated cathodes. 13th December, 1948. (654953.)

32955. Etablissements Alba.—Electromagnetically controlled friction clutches. 21st December, 1948. (655025.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia.—MELBOURNE.—19th June. Commonwealth Department of Works and Housing. Construction of a hydro-electric generating station at Rouna Falls. (C.R.E. (I.B.) 60819/51. Ten/2460.)*

BRISBANE.—18th July. State Electricity Commission of Queensland. Alternators for the Longreach, Barcaldine and Blackall Shire Councils. (C.R.E. (I.B.) 61071/51. Ten/2462.)*

3rd August. City Council. Supply of 200 kVA distribution transformers. (C.R.E. (I.B.) 60956/51. Ten/2467.)*

SYDNEY.—12th July. Sydney County Council. 66 kV arc suppression coil. (C.R.E. (I.B.) 60297/51. Ten/2430.)*

Cambridge.—City Council. Street lighting equipment. (See 18th May issue.)

Haslingden.—2nd June. Borough Council. Electrical work in 32 new dwellings, Church Street and Bury Road. J. Mason, borough engineer, Municipal Offices.

Ireland.—3rd September. Electricity Supply Board, Dublin. One 30 MW turbo-alternator, condensing plant, etc., for Ringsend power station. (See this issue.)

New Zealand.—WELLINGTON.—17th July. State Hydro-Electric Department. Supply of eight 110 kV 1,500 MVA, and ten 110 kV 1,000 MVA circuit breakers. (C.R.E. (I.B.) 60578/51. Ten/2442.)*

Oswestry.—15th June. Borough Council. Improved lighting on the Swansea-Manchester Road. (See this issue.)

South Africa.—JOHANNESBURG.—14th June. Union Tender and Supplies Board. Diesel engine alternator sets. (C.R.E. (I.B.) 60745/51. Ten/2452.)*

Sowerby Bridge.—28th May. U.D.C. Street lighting installation. (See 18th May issue.)

Uruguay.—MONTEVIDEO.—18th June. Administracion General de la Usinas Electricas y los Telefonos del Estado. Supply of 1,200 porcelain insulators (C.R.E. (I.B.) 60100/51. Ten/2453.)* 20th June. Supply of 50 surge dischargers. (C.R.E. (I.B.) 60099/51. Ten/2454.)*

Worthing.—11th June. Borough Council. Re-wiring 130 houses, including the provision of power points and renewal of conduits in roof spaces, at South Farm Housing estate. Borough surveyor, Town Hall.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Blackpool.—Corporation Cleansing Committee. Recommended. Electrically operated paper baling press (£806).—Treece (Birmingham), Ltd.

London.—L.C.C. Housing Committee. Installation of electricity in dwellings at Hedgeman's Road site, Becontree, Essex (£1,661).—Rylands Electrical Co., Ltd. Installations at Tabard Garden estate, Southwark (£3,369).—Haines & Sheppard, Ltd.

POPLAR.—Borough Council. Electrical installations in 24 three-storey houses at Alpha Grove, Poplar (£1,485).—London Electricity Board.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barking.—Factory, Abbey Road; Chemical Supply Co., Ltd., 7, Idol Lane, E.C.3.

Bingley.—Houses, Bingley (30), Wilsden (16) and Cullingworth (10); U.D.C. surveyor.

Birkenhead.—Factory and lorry repair shop, Wallasey Bridge Road; Vacuum Oil Co., Ltd., Caxton House, London, S.W.1.

Birmingham.—Mission church at Rednal estate; Parsons & Morrin, Ltd., 133, Belgrave Road, Birmingham.

Bolton.—Houses (40), off Jesmond Road; A. S. Woods, builder, 42, Sherbourne Road.

Bournemouth.—Houses (148), Leybourne estate; borough architect.

Factory, Wallisdown Road; S. T. Meggitt & Son, Ltd., 28, Ainmhurst Road.

Chatham.—Extensions and adaptations at M.o.W. buildings for technical college (£200,000); Kent & Sussex Contractors, Ltd., builders, Station Road, Sidcup.

Chichester.—Factory for Stringers, Ltd., Chapel Street; Booker & Sons, builders, Wallerton, Arundel.

Coventry.—Dwellings (675), Hall Farm estate, Stoke Aldermoor; B. Reyner, architect, 5, Manor Road.

Dagenham.—Factory, Hainault industrial estate; Warton Flock Co. (Stratford), Ltd., Warton Road, E.15.

Darlington.—Houses (46), Springfield site; Shepherd & Son, Ltd., builders, York.

Houses (30) at Firth Moor for the T.C.; Boddy and Bell, builders, Thomas Street, Darlington.

Derby.—Extensions to factory of Derby & Midlands Mills, Ltd., Pybus Street; Ford & Weston, Ltd., Derby.

Eastbourne.—Rebuilding war destroyed stores, 133-137, Terminus Road; Marks & Spencer, Ltd., 72, Baker Street, W.1.

Two blocks of flats, Chatfield estate; borough engineer.

Glasgow.—Flats (36), Ladybank Drive, Bellahouston; city housing architect, 20, Trongate.

Glendale.—Houses (70), High Fair site, for R.D.C.; Reavell and Cahill, architects, Lloyds Bank Chambers, Alnwick.

Hayes (Middx).—Houses (46), Bourne Farm estate; U.D.C. surveyor.

Hazel Grove and Bramhall.—Houses (80), Bosden Fold Road, for U.D.C.; F. E. Capper, clerk, Council House, Hazel Grove, Stockport.

Holt (Norfolk).—Nurses' hostel at Kelling Sanatorium; Boardman & Son, architects, Queen Street, Norwich.

Hull.—New works, Sutton Road; Priestman Bros., Ltd., Thomas Street.

Ipswich.—Maternity unit, General Hospital; East Anglian Regional Hospital Board, 33, Parkside, Cambridge.

Kidderminster.—Extension to power house, Stourport Road; British Sugar Corporation, Ltd., Foley Park.

Leeds.—Flats (60), Seacroft estate; city architect.

Lincolnshire.—Secondary modern school, Redcombe Lane, Brigg, for Lindsey County Council; county architect, Lincoln.

Three new depots, Horncastle, Laceby and Louth (£16,000); Lindsey county architect.

Liverpool.—Erection of De la Salle Grammar School, Carr Lane East; Wm. Moss & Son, Ltd., Roscoe Street, Liverpool.

London.—CATFORD.—Flats (42), Bromley Road and Whitefoot Lane, for Lewisham B.C.; Fry, Drew and Partners, architects, 63, Gloucester Place, W.1.

HOLBORN.—Warehouse and offices, 60-66, Saffron Hill; Lander, Bedells and Crompton, architects, 36, Lambs Conduit Street, W.C.1.

Flats (60), Red Lion Square; borough architect.

POPLAR.—Extensions to technical college; Pite, Son and Fairweather, architects, 6, Queen Anne's Gate, S.W.1.

SOUTHWARK.—Flats (75), with laundry, New Kent Road, for L.C.C.; Lionel H. Fewster and Partners, architects, 22, Conduit Street, W.1.

WESTMINSTER.—Office block, 10-18, Victoria Street; Site Improvements, Ltd., 1, Queen Anne's Gate, S.W.1.

Manchester.—Works and offices at Trafford Park, for International Biscuit Co., Ltd.; Jones & Rawlinson, Ltd., Salford.

Melton Mowbray.—Maternity unit at infirmary; Pick, Everard, Keay and Gimson, architects, 6, Millstone Lane, Leicester.

Middlesbrough.—Houses (68), Berwick Hills estate; J. A. Kenyon, borough engineer.

Middleton.—Crematorium, Boarshaw Cemetery; Booth Tonge & Co., Ltd., Middleton.

Morpeth.—Houses (20), Hadstone housing site, for the R.D.C.; J. S. Miles, surveyor.

Newcastle - upon - Tyne. — Extensions, Richardsons Leather Works (£10,000); Stephen Buy, 224, Westgate Road, Newcastle.

Northampton.—Houses (80), Sunniside estate; borough architect.

Northants.—Extensions to Corby Technical College (£58,000); county architect, Northampton.

Nottinghamshire.—Fire stations at Edwalton, Kirby-in-Ashfield, Worksop and Ruddington; county architect, Trent Bridge, Nottingham.

Port Talbot.—Extensions to Margam Works; British Industrial Solvents, Ltd., 82, Piccadilly, W.1.

Preston.—Operating theatre for Ear, Nose and Throat Dept., Royal Infirmary; Lillie and Kirkham, architects, Dowry House, Bamber Bridge, near Preston.

Reigate.—County secondary school (£66,189) for Surrey E.C.; Burnand and Pickett, builders, 14, Woodcote Road, Wallington.

Sale.—Dwellings (70) at Baguley Lane estate No. 3; F. Entwisle & Co., Ltd., Broadway, Davyhulme.

Salford.—Additional classrooms, Trafford Road Girls' School; Halliday and Agate, architects, 14, John Dalton Street, Manchester.

Sheffield.—Engineering shop, warehouse and offices, Carlisle Street and Dorking Street; Morgan Fairest, Ltd., 44/62, Sorby Street.

Shipley.—Offices for the Metal Box Co., Ltd., Wrose Brow Works; Thomas Obank & Sons, Ltd., builders, Thackley, Bradford.

Houses (88), Owlet estate; U.D.C. surveyor.

Southampton.—Proposed depot, offices, etc.; Rowntree & Co., Ltd., York.

South Wales.—Brewery for South Wales & Monmouthshire United Clubs Brewery Co., Ltd., Pontyclun; Sydney Culverwell, consulting engineer, 50, Hampton Park, Bristol.

Stafford.—Houses (22), Gnosall for R.D.C.; Tideswell Bros., Stoke-on-Trent.

Stanley (Co. Durham).—Houses (100) for miners; U.D.C. surveyor.

Stretford.—Rebuilding and extensions, King Street Central Library; Howard and Benson, architects, 88, Mosley Street, Manchester, 2.

Swansea.—New fire station, Mount Pleasant; Robert Hudson, borough engineer, The Guildhall.

Tarleton (Lancs).—R.C. church and presbytery; L. Yates & Co., Ltd., Ribble Bank Mills, Preston.

Todmorden.—Houses (48), Harley Wood; E. Taylor & Co., Ltd., Ebor Sawmills, Littleborough.

Warrington.—New engineering and building block, Museum Street site, as first instalment of college of technology; borough engineer.

Wellingborough.—Houses (76), Croyland Hall Farm estate; U.D.C. architect.

Whitehaven.—Public halls, restaurant and museum, Lowther Streeet (first stage); Pratt and Gray, architects, 399/401, High Street, London, E.15.